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ALBUQUERQUE OPERATIONS OFFICE

ENVIRONMENT, SAFETY, AND HEALTH DIVISION

ENVIRONMENTAL PROGRAMS BRANCH

COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM

PHASE 1: INSTALLATION ASSESSMENT ROCKY FLATS PLANT

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NOT FOR PUBLIC DISSEMINATION

May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.

April 1986

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EXECUTIVE SUMMARY

The US Department of Energy (DOE) Rocky Flats Plant has been evaluated under Phase I of the Comprehensive Environmental Assessment and Response Program (CEARP) with respect to inactive waste disposal sites, accidentally contaminated sites, current waste management practices, existing and potential surface water and groundwater contamination, and compliance with applicable federal, state, and local environmental regulations A major thrust of CEARP is to determine whether waste disposal practices followed in the past, prior to recognition of potential environmental hazards and/or the passage of environmental legislation, have resulted in environmental problems that require remedial action today. This Phase I CEARP report provides documentation for Phase I of the DOE Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Order 5480 14 and the following US Environmental Protection Agency (EPA) CERCLA preremedial activities (1) Federal Facility Site Discovery and Identification Findings (FFSDIF) (notification of newly discovered sites, including notification of negative findings), (2) Preliminary Assessment (PA), (3) Site Inspection (SI) [CEARP Preliminary SI (PSI)], and (4) Hazard Ranking System (HRS) evaluation

The Phase I CEARP report findings are based on a records search, open literature survey, interviews with Rockwell International employees, preliminary assessments, and site inspections. Therefore, the report is unavoidably subject to some uncertainty. Situations in which there is uncertainty regarding actual risk to public health and safety and to the environment will be further studied through field studies and data collection during CEARP Phase II (confirmative phase).

Potential sites identified during CEARP Phase I are presented in Tables EX-I through EX-4. As appropriate, the results for the potential sites are summarized based on a negative, positive, or uncertain finding for the following EPA CERCLA elements: (1) FFSDIF and (2) PA, SI (CEARP PSI), and HRS evaluation [including the DOE Modified HRS (MHRS)]. The HRS evaluation for the Rocky Flats Plant was conducted in two steps: (1) an overall evaluation (two aggregate scores) of the risk of the plant relative to other National Priorities List (NPL) sites; and (2) an evaluation of eleven individual sites within plant boundaries to determine relative hazards. The two aggregated scores for the overall evaluation were based on two separate surface water drainages with different public receptors The scores are summarized in Table EX-5 Both aggregated drainages

and three of the individual sites received scores exceeding the 28 5 threshold value for inclusion on the NPL

In addition, some of the sites do or possibly could exceed DOE remedial action criteria/guidelines and/or potentially could pose regulatory concerns and are recommended for future action Thirty-one sites have been recommended for further evaluation under the continued CEARP Phase I Installation Assessment, fourteen sites have been recommended for CEARP Phase II Confirmation, one site is currently into CEARP Phase IV Remedial Action, and twenty-one sites are currently into CEARP Phase V Compliance and Verification Rockwell International has or is currently conducting site characterization activities and remedial action at several sites.

Compliance with appropriate environmental statutes at the Rocky Flats Plant has been evaluated The areas identified in Phase I for further evaluation are (1) the underlying aquifer, to further characterize the extent and movement of the volatile organic compounds (VOCs) plume, (2) inactive disposal sites (or inactive portions of active disposal sites) and contaminated sites to determine the potential availability of hazardous substances to be released to the environment, (3) the management jurisdiction of radioactive/hazardous chemical mixed waste between DOE, EPA, and the State of Colorado; (4) the feasibility of segregating RCRA-regulated waste from byproduct material and/or from candidate mixed waste, (5) a method of disposal for noncombustible, radioactive, PCB-contaminated materials; (6) emissions of VOCs to the atmosphere; (7) sites that might be historic located within the plant boundaries; (8) seeps and springs areas for potential wetland impacts, and (9) hydrological monitoring programs, to ensure their capability to detect hazardous substances in ground and/or surface water

Table EX 1. Potential CERCLA Sites Identified During CEARP Phase I with Possible Radioactive Waste or Contamination

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] Finding	HRS[b] Score	mHRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Red Soil Burial (300 Area)	Removed	NA[d]	NA	NA	None	Compliance and Verification (Phase V)
Red Site (400 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Red Sites (2) (500 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Red Sites (2) (600 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Red Sites (4) (700 Area)						
Site 1	Inactive	Positive	NE[e]	NE	None	Installation Assessment (Phase I, Supplemental)
Site 2	Inactive/ Immobilized	NA	NA	NA	None	Compliance and Verification (Phase V)
Site 3	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Site 4	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Red Sites (2) (800) Area						
Site 1	Inactive/ Covered	Positive	20	0	None	Confirmation (Phase II)

Table EX.1. Potential CERCLA Sites Identified During CEARP Phase I with Possible Radioactive Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I			Planned future Action	
		FFSDIF/PA/PSI[a] finding	HRS[b] Score	HRMS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Site 2	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
903 Lip Area (900 Area)	Inactive/ Partially Removed	NA	NA	NA	None	Remedial Action (Phase IV)
Triangle Area (900 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)

[a] Federal facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d] Not Applicable
[e] Not Evaluated

Table EX.2. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Radioactive/Hazardous Chemical Waste or Contamination

Site	Status	DOE CEARP Phase I: FFSDIF/PA/PSI[a] Finding	DOE CEARP Phase I: HRS[b] Score	DOE CEARP Phase I: HWRS[b] Score	Planned Future Action: EPA CERCLA Program Element	Planned Future Action: DOE CEARP/CERCLA[c] Order Phase
Original Process Waste Lines (all areas)	Inactive/ Covered	Positive	NE[d]	NE	None	Installation Assessment (Phase I, Supplemental)
Original Landfill (OPS)	Inactive/ Covered	Positive	15	5	None	Confirmation (Phase II)
Present Landfill (OPS)	Active/ Inactive	Positive	34	5	Remedial Investigation	Confirmation (Phase II)
Trench T-1 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trench T-2 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trench T 3 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trenches T-4 to T-11 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
207 Solar Evaporation Ponds (900 Area)	Active	Positive	46	7	Remedial Investigation	Confirmation (Phase II)
Retention Ponds (OPS/Buffer Zone)	Active	Uncertain	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Cooling Tower Ponds (400 Area)	Inactive/ Covered	Positive	12	NE	None	Confirmation (Phase II)

Table EX.2. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Radioactive/Hazardous Chemical Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I				Planned Future Action	
		RFEDS/PA/SI[a] Finding	HRS[b] Score	HRMS[b] Score		EPA CERCLA Element	DOE CEARP/CERCLA[c] Other Phase
903 Drum Storage Area (700 Area)	Inactive/ Cleaned	Positive	26	1		None	Confirmation (Phase II)
Mound Area (700 Area)	Inactive/ Cleaned	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Out-of-Service Process Waste Tanks (700 Area)	Inactive	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Concrete Process Waste Tanks (700 Area)	Spill	NA[d]	NA	NA		None	Compliance and Verification (Phase V)
Radioactive Liquid Waste Storage Tanks (700 Area)	Spill	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Holding Tanks (700 Area)	Spill	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Valve Vault 7 (700 Area)	Spill	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Sewer Line Break (700 Area)	Spill	Positive	NE	NE		None	Installation Assessment (Phase I, Supplemental)
Radioactive Liquid Leaks (8) (700 Area)	Leaks	NA	NA	NA		None	Compliance and Verification (Phase V)

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INCOMPLETE DOCUMENT

The following document is missing pages EX-7 an EX-8 (DO44571-DO44572). This document was distributed in an incomplete state, and the microform copy is representative of the paper copy. If replacement pages are distributed, they will be microfilmed and included in the Administrative Record file.

The Adminstrative Record Staff

Table EX 3. Potential CERCLA Sites Identified During CEARP Phase I with Possible Nonradioactive Hazardous Chemical Waste or Contamination

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] Finding	HRS[b] Score	MHRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Cooling Tower Blowdown (300 Area)	Inactive	Positive	NE[d]	NA[e]	None	Installation Assessment (Phase I, Supplemental)
Cooling Tower Blowdown (700 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Hillside Oil Leak (800 Area)	Leak	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Oil Leak (400 Area)	Leak	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Oil Sludge Pit (800 Area)	Inactive/ Covered	Positive	9	NA	None	Confirmation (Phase II)
Fuel Oil Leak (300 Area)	Leak	NA	NA	NA	None	Compliance and Verification (Phase V)
Fuel Oil Tank (600 Area)	Spill	NA	NA	NA	None	Compliance and Verification (Phase V)
Lithium Metal Destruction Site (300 Area)	Inactive/ Built Over	Positive	8	NA	None	Confirmation (Phase II)
Reactive Metal Destruction Site (900 Area)	Inactive/ Covered	Positive	16	NA	None	Confirmation (Phase II)
Chemical Storage (500 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)

Table EX 3. Potential CERCLA Sites Identified During CEARP Phase I with Possible Nonradioactive Hazardous Chemical Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDLF/PA/PSI[a] Finding	HRS[b] Score	HWRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Fiberglassing Sites (2) (600 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Liquid Dumping (800 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Chemical Burial (800 Area)	Inactive/ Covered	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Outfall (800 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Out of Service Fuel Tanks (800 Area)	Inactive/ Filled	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Acid Leaks (2) (400 Area)	Leak	Negative	NA	NA	None	None
Acid Leak (300 Area)	Leak	Negative	NA	NA	None	None
Multiple Acid Spills (800 Area)	Spill	Negative	NA	NA	None	None
Caustic/ Acid Spills (700 Area)	Spill	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Caustic Leak (400 Area)	Leak	Negative	NA	NA	None	None

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The Admınstrative Record Staff

Table EX.3. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Nonradioactive Hazardous Chemical Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I			Planned future Action	
		FFSDIF/PA/PSI[a] finding	MRS[b] Score	HRMS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
VOCs in Groundwater	Leak	Positive	40	NA	Remedial Investigation	Confirmation (Phase II)

[a] Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
NE Not Evaluated
NA Not Applicable

Table ES.6. Potential CERCLA Sites Identified During CEARP Phase I at Offsite Locations

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSIF/PA/PSI[a] findings	HRS[b] Score	HRMS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Land Surface Contamination	Inactive	NA[d]	NA	NA	None	Compliance and Verification (Phase V)
Great Western Reservoir	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Standley Lake	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Mower Reservoir	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)

[a] Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d] Not Applicable

Table EX 5 Hazard Ranking Summary

Site	Total Migration Mode		Direct Contact Score		Fire/ Explosion Score	
	Chem	Rad	Chem	Rad	Chem	Rad
Aggregated						
Walnut Creek	53	9	17	0	0	0
Woman Creek	40	6	0	0	0	0
Individual Sites						
Solar Evaporation Ponds	46	7	17	0	0	0
VOC in Groundwater	40	NA[a]	0	NA	0	NA
Present Landfill	34	5	0	0	0	0
903 Drum Storage Area	26	1	0	0	0	0
Radioactive Site 800 Area	20	0	0	0	0	0
Trenches T-1 to T-11	17	6	0	0	0	0
Reactive Metal Destruction Site	16	NA	0	NA	0	NA
Original Landfill	15	5	0	0	0	0
Cooling Tower Blowdown Ponds	12	NE[b]	0	NE	0	NE
Oil Sludge Disposal	9	NA	0	NA	0	NA
Lithium Metal Destruction Site	8	NA	0	NA	0	NA

[a] Not applicable

[b] Not evaluated

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1 INTRODUCTION

1.A. Background

US Department of Energy (DOE) facilities operate under a policy of full compliance with applicable environmental regulations while conducting their missions The DOE Albuquerque Operations Office (AL) initiated the Comprehensive Environmental Assessment and Response Program (CEARP) in mid-1984 to help fulfill that commitment at installations within the AL complex CEARP will also assist DOE in setting environmental priorities and will help provide justification for funding to carry out enhancements of existing programs or remedial actions where required Implementation of CEARP will be realized by combined forces of AL, individual DOE area offices, DOE prime contractors, Los Alamos National Laboratory, and other assistance as found to be necessary

1.B. Authority

Authority to implement CEARP is primarily derived from the following DOE and AL orders:

- Comprehensive Environmental Response, Compensation, and Liability Act Program (DOE 5480 14)
- Hazardous, Toxic, and Radioactive Mixed Waste Management (DOE 5480 2 and AL 5480 2)
- Prevention, Control, and Abatement of Environmental Pollution (Ch. XII of DOE 5480.1 and AL 5480 1)
- Environmental Protection, Safety, and Health Protection Information Reporting Requirements (DOE 5484 1 and AL 5484.1)
- Implementation of the National Environmental Policy Act (DOE 5440 1C and AL 5440 1B)

Federal and state regulations with particular importance to Rockwell International (RI) operations at Rocky Flats Plant are discussed in Sec. IV.

I.C. Purpose and Scope

CEARP is a phased program to identify, assess, and correct existing or potential environmental problems The review covers major environmental regulations such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), National Environmental Policy Act (NEPA), Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Toxic Substances Control Act (TSCA), and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), with emphasis on CERCLA and RCRA Past, current, and future practices to handle and dispose of hazardous substances, defined under CERCLA, are evaluated In addition, environmental pollution control requirements and environmental monitoring programs for hazardous substances are evaluated for both adequate understanding of pathways and regulatory compliance

I.D. Methodology

CEARP is being implemented in five phases, which exactly parallel DOE Order 5480 14 Additionally, the U.S. Environmental Protection Agency (EPA) has prepared guidance for federal facilities to carry out their responsibilities under CERCLA The EPA has outlined its plans and intentions in a series of program elements that are organized in a somewhat different fashion but constitute the same basic approach as CEARP (Federal Facilities Program Manual for Implementing CERCLA Responsibilities of Federal Agencies, final draft) The five CEARP phases are linked as indicated in Fig I 1 CEARP includes a review of major federal environmental regulations The review serves two primary purposes: (1) determines compliance with environmental regulations and (2) evaluates the interaction of CERCLA with other environmental regulations, for example, releases permitted under the CWA or CAA, and releases exceeding reportable quantities under CERCLA, or RCRA-related remedial activities and CERCLA-related remedial activities. The purposes of individual CEARP phases are as follows.

I.D.1. Phase I - Assessment of the Installation. Phase I objectives are to determine present compliance with environmental laws and to ascertain the magnitude of potential environmental concerns. Where insufficient data exist to accomplish this, the additional information necessary to complete the evaluation will be identified. The CEARP Phase I report will provide documentation for Phase I of the DOE CERCLA

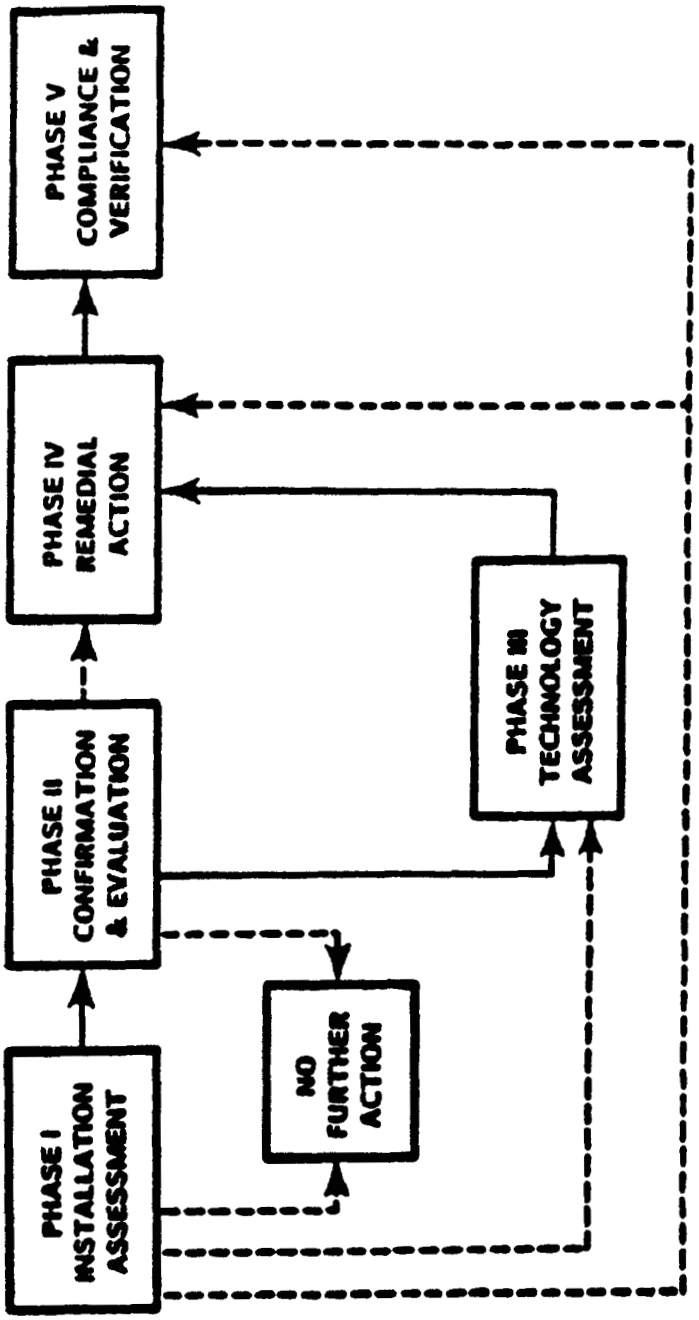

Figure I.1. CEARP Decision Flow Chart.

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Order and for the following EPA CERCLA preremedial activities (1) Federal Facility Site Discovery and Identification Findings (FFSDIF)--notification of newly discovered sites, including notification of negative findings, (2) Preliminary Assessment (PA) (3) Site Inspection (SI), and (4) Hazard Ranking System (HRS) evaluation (see I E 8, the Hazard Ranking System) Sites at Rocky Flats Plant are recommended for no further action when CEARP findings indicate (1) negative findings for the CERCLA FFSDIF process (e g, potential sites that are found not to exist or spills that were removed in the past through remedial action), or (2) sites initially requiring notification for the FFSDIF process that are later found to pose no threat of release under CEARP for the EPA CERCLA PA process (e g, potential sites where the hazardous substance initially identified, because of its stability, no longer persists in the environment) Consequently, sites at Rocky Flats Plant that no longer pose a threat of release are not included in the EPA HRS and DOE Modified HRS (MHRS) This procedure is consistent with guidance provided to federal facilities by EPA (Federal Facility Program Manual for Implementing CERCLA Responsibilities of Federal Agencies, final draft) (See Fig I 2)

Sites requiring HRS evaluation are scored as follows: (1) nonradioactive sites are scored with the EPA HRS and (2) radioactive sites are scored with the EPA HRS and the DOE MHRS. Sites meeting EPA criteria to be listed on the National Priorities List (NPL) are recommended for future action under DOE CERCLA Phase II to quantify the potential migration problem. DOE CERCLA Phase II activities are consistent with EPA CERCLA Sites that do not meet EPA criteria to be listed on the NPL but exceed other applicable DOE remedial action criteria/guidelines (e g, guidelines for the DOE Surplus Facilities Management Program) and/or sites posing potential regulatory compliance concerns (e g, RCRA-related remedial activities) are recommended for future action under CEARP. No further action is recommended for those sites not meeting these criteria

I.D.2. Phase II - Confirmation Phase II objectives are to (1) obtain additional information identified as necessary during Phase I, (2) complete an environmental evaluation to confirm the presence or absence of potential environmental problems identified in Phase I, and (3) plan and carry out measurement and sampling programs as required to understand potential sources of contaminants and potential environmental pathways.

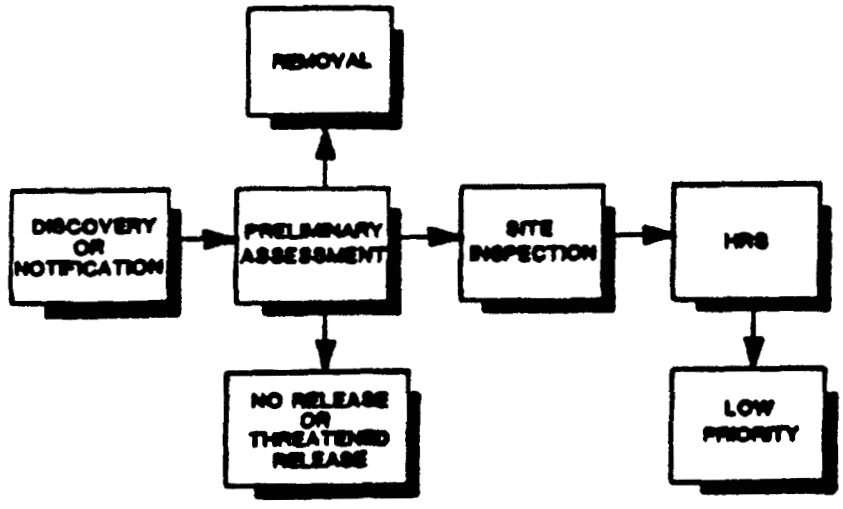

Figure 1 2. Initial Phases of Federal Agency-Lead Superfund Response Activities and Events.

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Confirmed problems will be assessed for health or environmental risk as a basis for setting priorities for remedial or other follow-up actions CEARP Phase II will provide documentation for Phase II of the DOE CERCLA Order (Phase IIA Monitoring Plan and IIB Site Characterization) and for two EPA CERCLA remedial planning program elements (Remedial Investigation Sampling Plan and Remedial Investigation)

I.D.3. Phase III - Technological Assessment Phase III objectives are to develop plans for remedial actions or enhancements of existing programs by proposing and assessing alternative technologies and approaches to eliminate or control environmental problems identified as needing correction in CEARP Phase II. The evaluation will include assessing the effectiveness of technology; impacts on health, safety, and the environment, and cost-benefit analysis where appropriate. This process will include identifying or developing appropriate criteria and performing any evaluation of environmental impact required by the NEPA. CEARP Phase III reports will provide documentation for Phase III of the DOE CERCLA Order and for two remedial planning program elements of EPA CERCLA (Feasibility Study and Remedial Action Selection).

I.D.4. Phase IV - Remedial Action. Phase IV objectives are to implement the recommended site-specific remedial measures identified in Phase III, which could include engineering design and construction to remedy or control environmental problems CEARP Phase IV will encompass requirements of the DOE CERCLA Order (Phase IV) and the remedial implementation program elements of EPA CERCLA (Design and Action)

I.D.5. Phase V - Compliance and Verification. Phase V objectives are to (1) verify and document the adequacy of remedial actions carried out in Phase IV, and (2) identify and plan for any continuing monitoring requirements needed to demonstrate control of migration or adequately recognize future problems. CEARP Phase V will encompass requirements of the DOE CERCLA Order Phase V and EPA CERCLA final site inspection/closeout and monitoring.

I.E. Phase I Implementation

CEARP Phase I was carried out at Rocky Flats Plant as a number of tasks. These tasks were performed by personnel of the Los Alamos National Laboratory Environmental Surveillance Group and Rockwell International (Rocky Flats Plant operating contractor)

I.E.1. Records Search and Literature Survey During the Rocky Flats Plant records search and open literature survey, existing documents in the following categories were reviewed and evaluated by Los Alamos personnel

- environmental documents
- development or management plans
- environmental monitoring reports
- federal/state/local permits
- operational records/documents
- safety analysis documents
- standard operating procedures
- appraisals, audits, inspections
- contingency/emergency plans
- special/topical studies or reports
- history and mission documents
- accident/incident investigation reports

Information acquired during the records search and literature survey that is directly related to CEARP is included and referenced as appropriate in this CEARP Phase I report. A listing of documents surveyed during the review process is provided in Appendix C This listing is representative of documents reviewed In addition, the appropriate CEARP-related Rocky Flats Plant internal files were reviewed. Appropriate AL CEARP-related files for Rocky Flats Plant were also reviewed

I.E.2. Employee Interviews. Rockwell International employees (former and current) identified as possibly having knowledge relevant to CEARP were screened to determine who would be interviewed. More than 30 Rockwell International employees familiar with or having responsibility for former and current management practices for hazardous substances, facility operations (e.g., processes that generated solid and liquid hazardous substances), or who might know about past leaks or spills of hazardous substances were identified during the screening process. These individuals were interviewed during the official review process to identify undocumented incidents or management practices that could have resulted in environmental concerns. Information from the interview process covers the complete history of Rockwell International at the Rocky Flats Plant. Those interviewed included 1 employee, 1951-1952; 2 employees, 1952-1955; 13 employees, 1955-1960; 21 employees, 1960-1970; 24 employees 1970-1980, 23 employees 1980-

1984 Current and past professionals in Operational Safety at Rocky Flats Plant (Technical Services, Industrial Hygiene, Health Physics, and Environment) were interviewed as well as those in Production, Product and Process Development, Engineering, Facilities Engineering, and Technology Application and Development A three-person team from Los Alamos National Laboratory conducted the interviews during the week of Sept 17, 1984. The interview notes were compiled and returned to the person interviewed to verify for accuracy The information from the interview process is included (as appropriate) in this CEARP Phase I report However, names, positions, and period of position performance have been omitted to preserve anonymity and ensure compliance with employee protection requirements of CERCLA (Section 110 of CERCLA)

Information collected represents individual recollections of events and conditions over an extended period of time, some of it as far back as three decades. This information was accepted at face value as an indicator of potential environmental concerns but cannot be taken as documented proof of environmental perturbations. However, any event or condition mentioned that had and/or has significant potential to release hazardous substances into the environment provided the basis for a recommendation that at least some confirmatory data be collected under CEARP Phase II. This approach ensures that suspect sites are characterized and that potential sources for release of hazardous substances are not overlooked. The intent is to have definitive documentation by the end of CEARP Phase II confirming the presence or absence of any environmental concerns

I.E.3. Evaluation of Waste Management. Present and past management practices for hazardous substances were reviewed and evaluated. Information for this process was gathered during the CEARP records search and literature survey, employee interviews, and investigation of current operations at the Rocky Flats Plant.

I.E.4. Identification of Contaminated Areas. Sites that have been contaminated or are suspected of being contaminated as a result of current or former practices, including leaks and spills, were identified. Information for this process was gathered during the CEARP records search and literature survey, employee interviews, and investigation of current operations at the Rocky Flats Plant.

I.E.5. Evaluation of Compliance with Environmental Regulations. An evaluation of compliance with applicable environmental standards and regulations, including

DOE orders and internal guidelines, was conducted Special emphasis was placed on those regulations that interact with CERCLA (e g, permitted releases under the CWA or CAA and exceeding reportable quantities under CERCLA)

I.E.6. Preliminary Physical Survey A preliminary physical survey of portions of Rocky Flats Plant was conducted to validate observations from the CEARP document search and interviews and to identify any other signs of environmental stress or facility features that might indicate a potential for contamination

I.E.7. Pathway Evaluation A preliminary evaluation of potential migration pathways for hazardous substances was made

I.E.8. The Hazard Ranking System (HRS) The HRS is used by EPA to establish a National Priorities List of facilities for initial attention under CERCLA. Effective Feb 18, 1986, federal sites meeting criteria to be listed on the NPL can be listed there.

The EPA HRS, however, does not discriminate among different radioisotopes relative to their potential risk at potential CERCLA sites. Therefore, DOE developed the MHRS, which is a conceptually minor modification/addition to the HRS. The MHRS permits a better assessment of existing radiological risks. Therefore, potentially radioactive sites are scored with DOE's MHRS and EPA's HRS, nonradioactive sites requiring evaluation are scored with EPA's HRS

II DESCRIPTION OF THE ROCKY FLATS PLANT

Rocky Flats Plant is a government-owned, contractor-operated (GOCO) facility Dow Chemical Company was the prime operating contractor for the Atomic Energy Commission (AEC), which was succeeded by the Energy Research and Development Administration (ERDA) and then by the Department of Energy (DOE) The North American Space Operations, Rockwell International, succeeded Dow Chemical Company as the prime contractor for DOE on July 1, 1975

In addition to the plant, three satellite facilities are maintained by Rockwell International as part of the plant's operations Two are leased facilities nearby (the Lake Arbor facility and the Broomfield facility) and one is located in Oxnard, Ca (Precision Forge) Lake Arbor houses engineering operations, a machine shop, purchasing departments, and office areas Broomfield houses a pipe fabrication and cleaning operation, a warehouse operation, and office areas Precision Forge, recently acquired by DOE and turned over to Rockwell International for operation, houses a high velocity forging operation that makes stainless steel components for the plant and for other contractors in the DOE nuclear weapons complex.

II.A. Location and Physical Characteristics

Rocky Flats Plant is located in northern Jefferson County, Co., approximately 16 air miles northwest of Denver The plant covers almost 11 mi^2 (approximately 6,550 acres), and occupies sections 1 through 4 and 9 through 15, of R70W,T2S, Jefferson County. The plant is centered at 105° 11' 30" west longitude and 39° 53' 30" north latitude.

To the north is Colorado State Highway 128; to the east is Jefferson County Highway 17, also known as Indiana Street, to the south is Colorado State Highway 72, and to the west is Colorado State Highway 93. Access is from either an east access road exiting from Jefferson County Highway 17 or a west access road exiting from Highway 93 Within 9 to 12 mi are the communities of Broomfield, Arvada, Golden, and Boulder Figure II 1 shows the general location of the plant.

The US Government approved construction of the plant in 1951 as an addition to the nation's nuclear weapons production complex Limited operations began in 1952

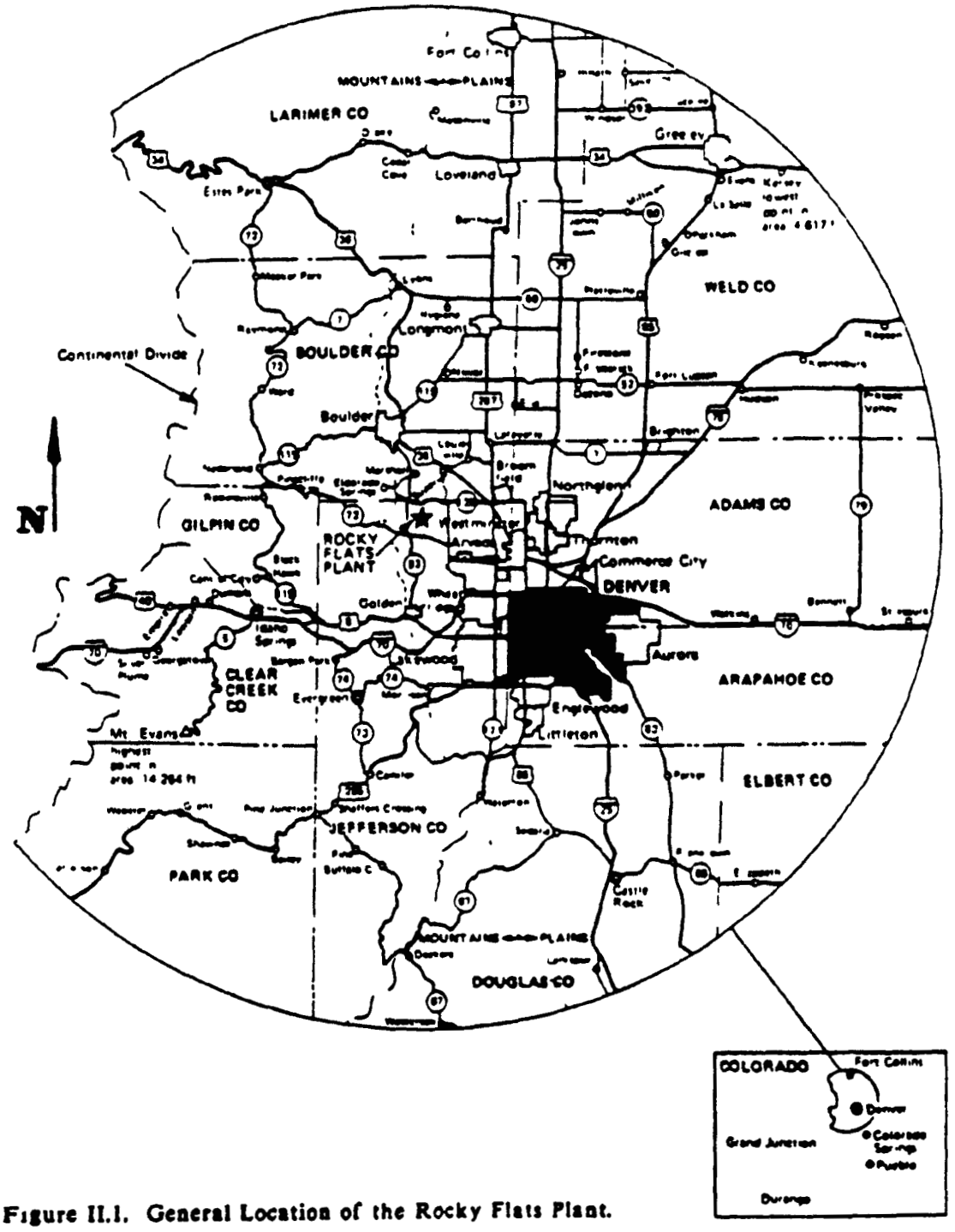

Figure II.1. General Location of the Rocky Flats Plant.

within a site area of 2,520 acres All buildings were constructed within a controlled area of less than 400 acres, and involved 700,000 ft^2 of building floor space in 20 structures Over the years, additional structures were built and today there are more than 100 buildings with a combined floor space of more than 2 1 million ft^2

The plant was enlarged to its present size of approximately 6,550 acres by adding a buffer zone in 1974-1975 (Fig II 2) The buffer zone was used by its former owners for grazing cattle and horses It is enclosed within a cattle fence and is posted with signs indicating restricted access Within this buffer zone are firebreaks, holding ponds on three water courses, environmental monitoring stations, a sanitary landfill, power lines, gravel pits, target ranges, access roads, and a wind energy test facility The wind energy test facility is not part of the defense program operations at the plant, and it is not evaluated as part of this study

Most of the operations at Rocky Flats Plant are performed within the security-fenced area shown in the center of Fig II 2 Figure II 3 is an enlargement of this area, showing the eight major subdivisions based on building numbers used in this report.

II.B. Mission

Rocky Flats Plant's primary mission is to produce plutonium and other metal components for nuclear weapons. Key production activities involve fabrication of plutonium, uranium, and nonradioactive metals (principally beryllium and stainless steel) Parts made at the plant are shipped elsewhere for assembly When a nuclear weapon is determined to be obsolete, components fabricated at the plant are returned to it for special processing to recover plutonium and americium. The plant has specialized facilities and equipment for handling these materials, as well as personnel with extensive knowledge in the chemistry and fabrication of plutonium, beryllium, and other materials that require special handling.

II.C. Demographics

Approximately 50% of the area within 10 mi of the plant is in Jefferson County, the remainder is divided between Boulder County (40%) and Adams County (10%) According to the 1973 Colorado Land Use Map, 75% of this land was unused or was used for agriculture. Since that time, portions of this land have been converted to housing, and today, several new housing subdivisions are being started within a few miles of the

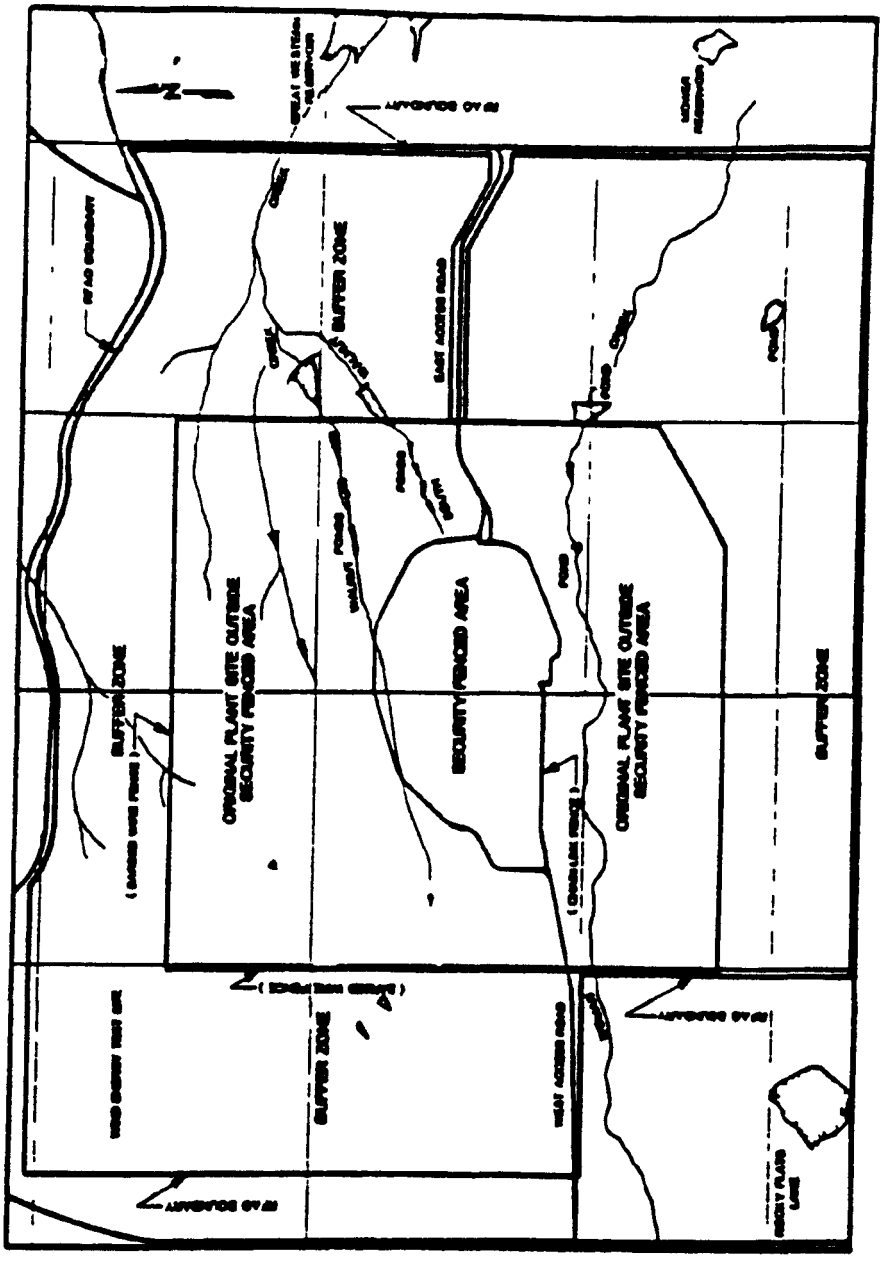

Figure II 2. Rocky Flats Plant Site

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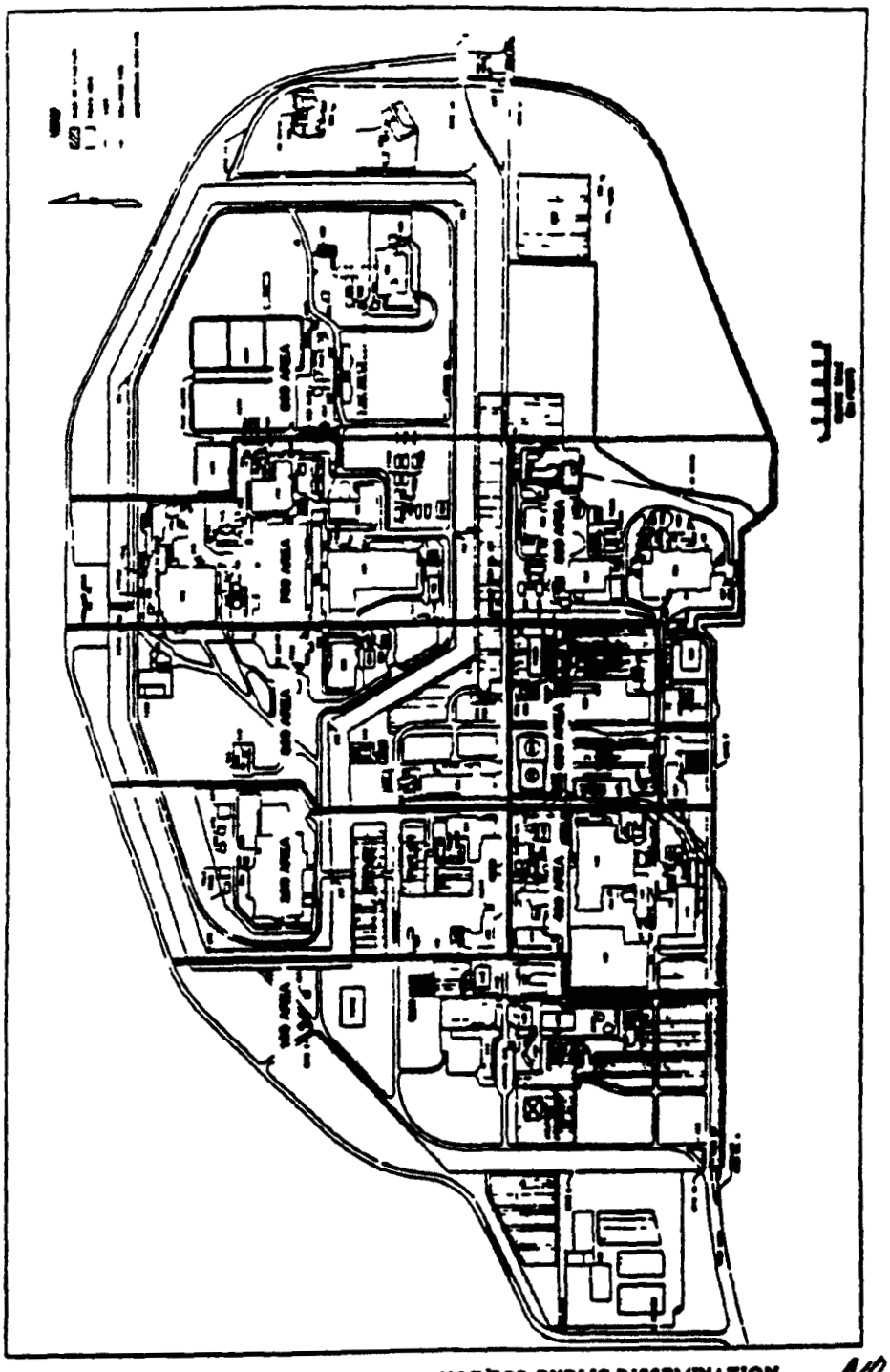

Figure II 3 Areas within the Security Fence.

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buffer zone (One is located south of the Jefferson County Airport, and several are located southeast of the plant)

A demographic study, based on 1980 census data (AEMR 1985), shows that the 1980 population living within 50 mi of the plant was approximately 1 8 million people, with a projected increase to 3 5 million by the year 2000 Within 5 mi of the plant were about 9,500 people, with projected increases to about 20,000 people by the year 2000 The most populous sector was to the southeast, toward the center of Denver This sector (between 10 and 50 mi of the plant) had a 1980 population of about 555,000 people with projected increases to 1,500,000 by the year 2000

II.D. Important Site Characteristics

Rocky Flats Plant is located near large urbanized areas making accidental releases of hazardous substances, past and current, a sensitive issue to the immediate population Past releases of radioisotopes at Rocky Flats Plant have been made public by Rockwell International and there has been routine annual reporting of environmental information Public reaction to these announcements has become increasingly adverse with the continued growth of the urbanized areas and the antinuclear movement The plutonium releases have resulted in extensive monitoring and cleanup efforts, but also in litigation against the plant for negative impacts offsite.

The local hydrology is controlled by a thin gravelly alluvium that is very permeable Surface and groundwater flow is from west to east, originating in the Front Range Groundwater is known to surface at seeps and springs within the natural streams traversing the site and flowing to Great Western Reservoir or to Standley Lake. Both of these bodies of water serve as drinking water supplies for nearby population centers. Recently detected volatile organic compounds (VOCs) in the shallow aquifer at Rocky Flats Plant have caused additional adverse public reaction to its operations This topic is discussed in Section IV and Section V

III ENVIRONMENTAL SUMMARY

The area surrounding the Rocky Flats Plant is primarily agricultural or currently undeveloped Its environs are influenced by the Front Range of the Rocky Mountains immediately to the west and by the location of the plant at 6,000 ft above sea level The surficial geology is best described by the name 'rocky flats' The plant is located on the eastern edge of a geological bench, about 5 mi wide in an east-west direction, flanking the foothills of the Front Range The stony soil was formed by alluvial outwash from the mountains This deposit consists largely of gravel and cobbles intermixed with sand and clay Low precipitation, drying winds, and a permeable gravel substrate contribute to the arid environment, which is reflected by short-grass prairie vegetation found growing on this geological bench

III A. Meteorology

The area surrounding Rocky Flats Plant has a semiarid climate characteristic of much of the central Rocky Mountain region Temperatures are moderate, extremely warm or cold weather is usually of short duration On the average, daily summer temperatures range from 55°F to 85°F and winter temperatures range from 20°F to 45°F Low average relative humidity (46%), due to the blocking effect of the Rocky Mountains, produces a very comfortable climate

Forty percent of the 15-in annual precipitation falls during the spring season, much of it as wet snow Thunderstorms (June to August) account for an additional 30% of the annual precipitation. Autumn and winter are drier seasons, accounting for 19 and 11% of the annual precipitation, respectively Snowfall averages 85 in/yr, falling from October through May

Because of its location, 4 mi east of the foothills of the Continental Divide, the area experiences Chinook winds with gusts occasionally exceeding 100 mi/h The recurrence period for high winds and winds associated with tornadoes has been analyzed; the 100-yr return-period wind speed is 103 mi/h and the one million year return-period wind speed is 168 mi/h (Coates 1984)

Special attention has been focused on dispersion meteorology surrounding Rocky Flats Plant due to the remote possibility that significant atmospheric releases might affect

the Denver metropolitan area Studies of airflow and dispersion characteristics are available (Crow 1974, Hodgin 1984)

The studies by Crow indicate that drainage flows (winds coming down off the mountains to the west) turn and move toward the north and northeast along the South Platte River Valley to the west and north of Brighton, Co These drainage flows are of particular interest because they occur under stable atmospheric dispersion conditions (generally at night) when atmospheric mixing is limited Thus a release to the atmosphere under "worst case" dispersion conditions would not be expected to move directly over Denver

III.B. Geology

Rocky Flats Plant is located on a broad, eastward sloping plain of overlapping alluvial fans developed along the Front Range of the Rocky Mountains These fans extend about 5 mi in an east-west direction originating on the west in the abruptly rising Front Range and terminating on the east at a break in slope to low rolling hills The Continental Divide is about 26 mi west of the plant

At Rocky Flats Plant, more than 12,000 ft of sedimentary rock formations overlie the Precambrian crystalline basement rock The following brief geological description is presented for the upper 1,200 ft of these formations A detailed description of the geology, structure, and stratigraphy are found in the following references Dames and Moore 1981, Lovering 1932, Malde 1955, Robson 1981, Scott 1963, 1965, and 1972, Spencer 1961, DOE 1981, and Van Horn 1972 A map showing the surficial geology surrounding the plant is shown in Fig III 1.

The upper 1,200 ft of sedimentary rock formations in ascending order are the Fox Hills Sandstone, the Laramie Formation, the Arapahoe Formation, the Rocky Flats Alluvium, and colluvium on walls of the valleys or alluvium in stream channels within the valleys The Fox Hills Sandstone is a marine deposit of sandy shale grading up into a massive sandstone. The thickness usually ranges from 35 to 100 ft. Figure III.2 illustrates the geologic cross-section in the area surrounding the plant.

The Fox Hills Sandstone is overlain by the Laramie Formation. The Laramie Formation is a continental deposit divided into two units. a lower sandstone unit and an upper shale unit The sandstone unit is about 90 ft thick overlain by the shale unit,

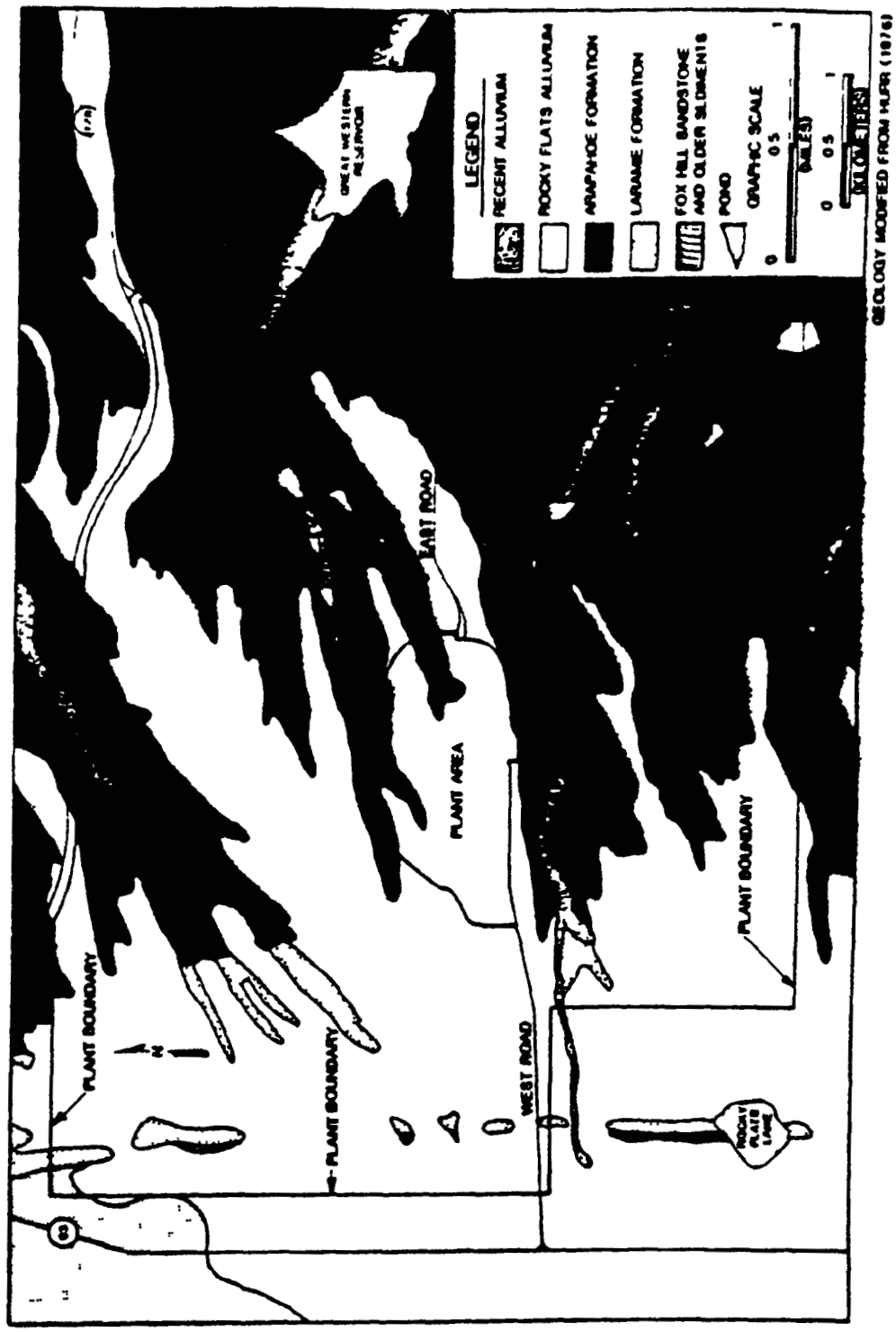

Figure III 1 Surficial Geology Map of the Area Surrounding Rocky Flats Plant

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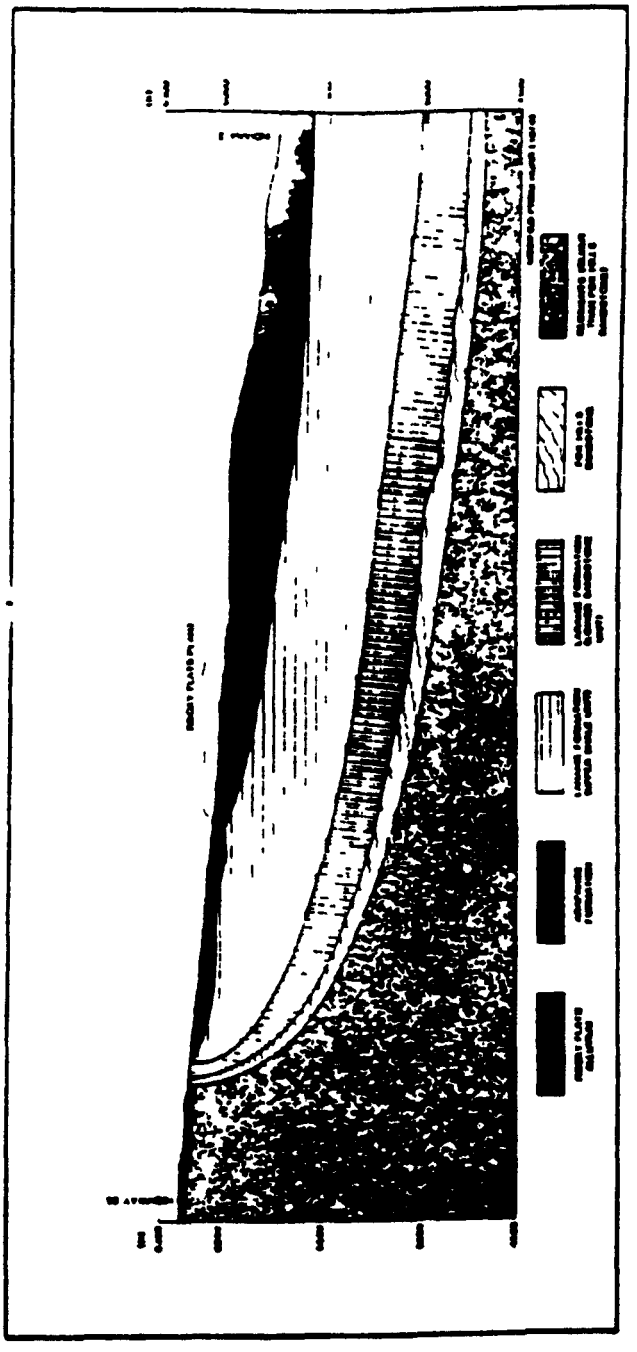

Figure III 2. Generalized Geologic Cross-Section Showing Geologic Units Beneath the Plant

which is about 320 ft thick The lower sandstone unit and the Fox Hills Sandstone are collectively referred to as the Laramie Fox Hills aquifer

The Laramie Formation is overlain by the Arapahoe Formation, a continental deposit of claystone with thin lenses of sandstone The thickness is about 270 ft at Rocky Flats Plant The valleys north, east, and south of the plant are cut into and expose portions of the Arapahoe Formation

The Arapahoe Formation is overlain by the Rocky Flats Alluvium, a series of coalescing alluvial fans deposited as outwash from the Front Range The alluvium consists of a chaotic deposit of gravels and boulders in a mixture of clay, silt, and sand The alluvium was deposited on an erosional surface of the Arapahoe Formation, thus the thickness varies, ranging up to 50 ft. A clay loam soil has developed in the upper surface of the alluvium In places the soil contains some calcium carbonate (caliche) layers The Rocky Flats Alluvium contains a shallow body of groundwater, which can locally perch on the Arapahoe Formation The closeness of this perched aquifer to the surface of the ground allows it to strongly influence the local hydrology.

Colluvium on the valley's slopes has formed from mass wasting of the Rocky Flats Alluvium and claystone of the Arapahoe Formation The colluvium is usually quite thin, resting on the claystone and lenticular sands of the Arapahoe Formation Landslides in the colluvium or creep of the colluvium occur on the valley's slopes because of the angle of the contact with the Arapahoe Formation and lubrication along the contact by water infiltrating the colluvium This phenomenon is important to Rocky Flats Plant because of the potential for landslides to damage retention ponds and diversion ditches. Thin sections of alluvium are formed by erosion and by deposition in the stream channels in the valley

III.C. Hydrology

The major part of this section on hydrology is taken from Blume 1972, Hurr 1976, RFEIS 1980, Robson 1981, and AEMR 1983.

Rocky Flats Plant's operational area is located on the eastern margin of a geologic bench between two stream cut valleys: North Walnut Creek and Woman Creek. Baseflow in the creeks is caused by a combination of precipitation and discharge of groundwater. South Walnut Creek originates immediately east of the operational area North and South

Walnut Creeks join prior to draining into Great Western Reservoir, which provides water for the community of Broomfield Woman Creek, southeast of the plant, drains into Standley Lake, which provides water to Westminster, Thornton, and Northglenn Most water entering these reservoirs is from ditches that divert runoff from Front Range creeks Church Ditch, McKay Ditch, Smart Ditch, South Boulder Division Canal, and Kinnear Ditch and Reservoir Company Ditch traverse the plant, conveying water from the Front Range to offsite lakes and reservoirs east of the plant Runoff from the plant's operational area is retained in onsite ponds and released after satisfying compliance with the appropriate Colorado Department of Health Standards and EPA NPDES permit conditions

III.C.1. Surface Water Three intermittent streams drain the plant: Rock Creek drains the northwest corner, Woman Creek drains the southern third, and North and South Walnut Creeks drain the remainder No naturally occurring ponds or lakes are within plant boundaries Interceptor ditches have been constructed to collect and divert all runoff from the plant's operational areas

III.C.1.a. Walnut Creek. Walnut Creek (North and South Walnut branches) is a small, intermittent stream North Walnut Creek flows to the north of the plant and has a drainage area of about 1 2 mi^2 within the boundaries of the plant South Walnut Creek originates within the plant and has a drainage area of about 0 46 mi^2 (Fig III 3) North Walnut Creek and South Walnut Creek join together onsite about 0.5 mi west of Indiana Avenue (eastern plant boundary) From that point, Walnut Creek flows southeast into Great Western Reservoir However, most of the water in Great Western Reservoir comes from Church Ditch, which conveys water from Clear Creek

The plant has maintained as close to zero discharge as possible to Walnut Creek since 1979. To accomplish this, several steps have been taken

(1) Local runoff and groundwater seepage that naturally collect in retention ponds A-1 and A-2 are disposed of through evaporation (These retention ponds are discussed in Sec. III C.1.d.) High pressure spray over the pond's surface facilitates the evaporation process.

(2) Liquid effluent from retention pond B-3 is evaporated at a spray irrigation plot located on the interdrainage area south of retention pond B-3 or is pumped to the onsite

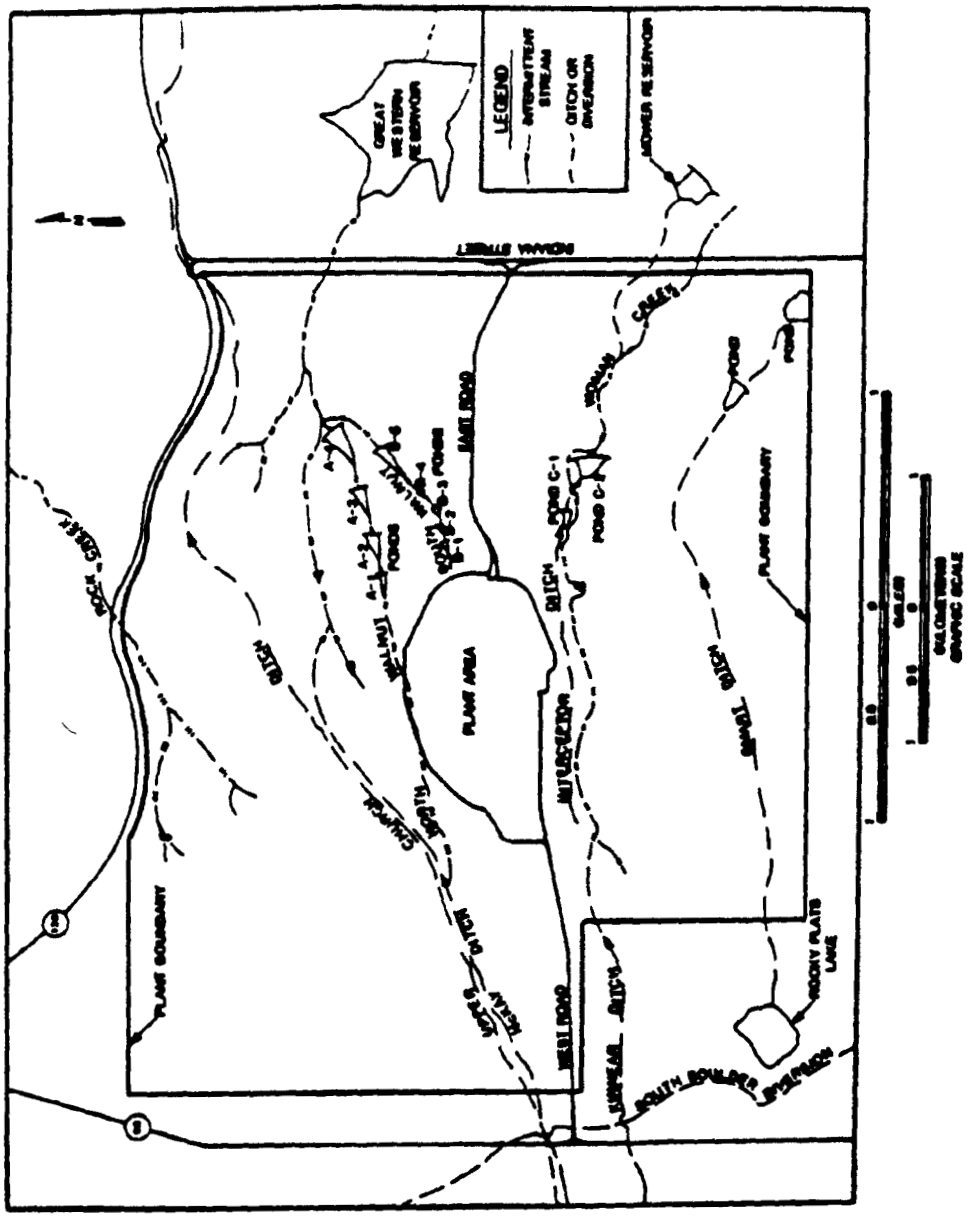

Figure III 3. Map showing Surface Drainage and Retention Ponds at Rocky Flats Plant

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reverse osmosis facility where it is treated or is occasionally released through retention ponds B-4 and B-5 into Walnut Creek, after testing to show compliance with NPDES limitations (These retention ponds are discussed in Sec III C 1 d) Treated water from the reverse osmosis facility is then recycled in the plant's cooling towers

(3) An interceptor system was installed between the solar evaporation ponds and Walnut Creek to prevent nitrate solutions from entering Walnut Creek (The ponds are discussed in Sec III C 1 e) Nitrate waters are pumped back into the solar ponds and are subsequently spray irrigated in the west buffer zone of the plant

III.C.1.b. Woman Creek Woman Creek is a small intermittent stream that drains the southern portion of the plant Streamflow is from snowmelt, runoff, precipitation, and from groundwater springs and seeps. The drainage area of Woman Creek west of Indiana Avenue is 2 1 mi^2, the majority of which is located within the boundaries of the plant. Woman Creek, east of Indiana Avenue, flows southeast into Standley Lake.

III.C.1.c. Rock Creek Rock Creek is an intermittent stream that flows northeast through the extreme northwest corner of the plant. No surface drainage from the operational areas of the plant enters the Rock Creek basin.

III C 1 d Retention Ponds Retention ponds designated as the A, B, and C series are located along Walnut and Woman Creek (Fig III 3)

Four retention ponds, located on North Walnut Creek, are designated as A-1, A-2, A-3, and A-4 downgradient from west to east Ponds A-1 and A-2 are reserved for spill control. Stream flow from North Walnut Creek is diverted past them via a diversion pipe Pond A-3 receives runoff from the plant and from North Walnut Creek's streamflow Pond A-4 is designed to handle the 100-yr flood and is used for surface water control and additional storage capacity as a backup to pond A-3

Five retention ponds, located on South Walnut Creek, are designated as B-1, B-2, B-3, B-4, and B-5, downgradient from west to east. Ponds B-1 and B-2 are reserved for spill control. Pond B-3 receives treated sanitary sewage effluent from the plant's sanitary sewage treatment plant. Ponds B-4 and B-5 receive surface runoff and occasionally discharge from pond B-3 Pond B-5, designed to handle the 100-year flood, is used for surface water control, and receives water from pond B-4

Two retention ponds are located along Woman Creek south and east of the plant From west to east, they are designated ponds C-1 and C-2, respectively Pond C-1 is located on Woman Creek Pond C-2, offset from Woman Creek, receives surface runoff water from an interceptor ditch parallel to the south side of the plant's production areas Water in pond C-1 is bypassed around pond C-2 into the Woman Creek channel Water in pond C-2 is discharged downstream into Woman Creek in accordance with NPDES permit limitations

III.C.1.e. 207 Solar Evaporation Ponds Three lined solar evaporation ponds are on the north-central edge of the main operations area. They are designated as 207A, 207B, and 207C Pond 207B is separated into three sectors north, central, and south.

Ponds 207A and 207C presently contain low-level radioactive liquid process wastes (high in nitrates) being held for evaporation and/or treatment Pond 207B North receives leachate from a drain system installed on the north-facing hill slope below the solar ponds At times, intercepted groundwater is transferred from 207B North to a spray irrigation plot on land located in the western portion of the plant site Pond 207B Center contains treated sanitary sewage water, which is disposed of by spray irrigation. Pond 207B South also contains product water from the sanitary sewage treatment plant to be processed through the reverse osmosis plant and recycled for use in the steam plant or cooling towers.

III.C.1.f. Landfill Retention Pond A retention pond is located on a tributary of North Walnut Creek downstream from the present landfill operation This pond primarily collects surface runoff that may have contact with the landfill It also collects leachate from beneath the landfill. To avoid accumulation, water from this pond is spray irrigated onsite onto land south of the landfill after water quality analysis is performed.

III.D. Groundwater

Small amounts of groundwater are in the alluvium and colluvium in the valleys. The major occurrence of groundwater is found in the Rocky Flats Alluvium. Minor amounts occur in sandstone lenses in the Arapahoe Formation, and in the Laramie-Fox Hills Aquifer

III.D.1. Alluvium and Colluvium in Stream Channels Alluvium in the stream channels in the valley is quite thin, on the order of 10 ft It is quite permeable, thus recharge from streamflow is rapid In areas where streamflow is intermittent, the volume of water in the alluvium will vary rapidly in response to recharge or lack of recharge Only small amounts of water (usually seasonal) occur in the colluvium on the valley slopes

III.D.2. Rocky Flats Alluvium The Rocky Flats Alluvium, which is quite permeable, contains groundwater Recharge to the alluvium is from precipitation, snowmelt, and water losses from ditches, streams, and ponds that are cut within the alluvium The water table fluctuates in response to the recharge Water levels are highest in the spring from snowmelt and generally decline during the rest of the year.

General water movement in the Rocky Flats Alluvium is from west to east (Fig. III 4) Discharge from the alluvium occurs at minor seeps and springs in the colluvium that covers the contact of the Rocky Flats Alluvium and Arapahoe Formation along the edges of the valleys The velocity of water movement in the aquifer is estimated at 7 to 18 ft/d (Hurr 1976). Using an average velocity of 12 ft/d, it would take approximately 1 year for water to move from west to east beneath the plant (length of about 1 mi) The hydrologic conductivity of the alluvium is estimated at about 35 ft/d Data recently collected at Rocky Flats Plant indicate that the velocity of groundwater in the Rocky Flats Alluvium could be lower (HS 1985).

The thickness of the Rocky Flats Alluvium varies because of the irregular surface of the Arapahoe Formation (Fig III 5) The saturated thickness of the alluvium depends on variable amounts of recharge The claystone in the Arapahoe Formation tends to restrict and perch water in the overlying alluvium. High areas of the Arapahoe Formation result in thin sections of the overlying alluvium This results in areas where the alluvium is above the water table. Channels in the Arapahoe Formation will contain thick sections of saturated alluvium (Fig. III 6).

The Rocky Flats Alluvium terminates west of the plant boundary and, therefore, does not supply water to wells located downgradient from the plant. However, discharge of water from the alluvium into surface water and retention ponds does take place.

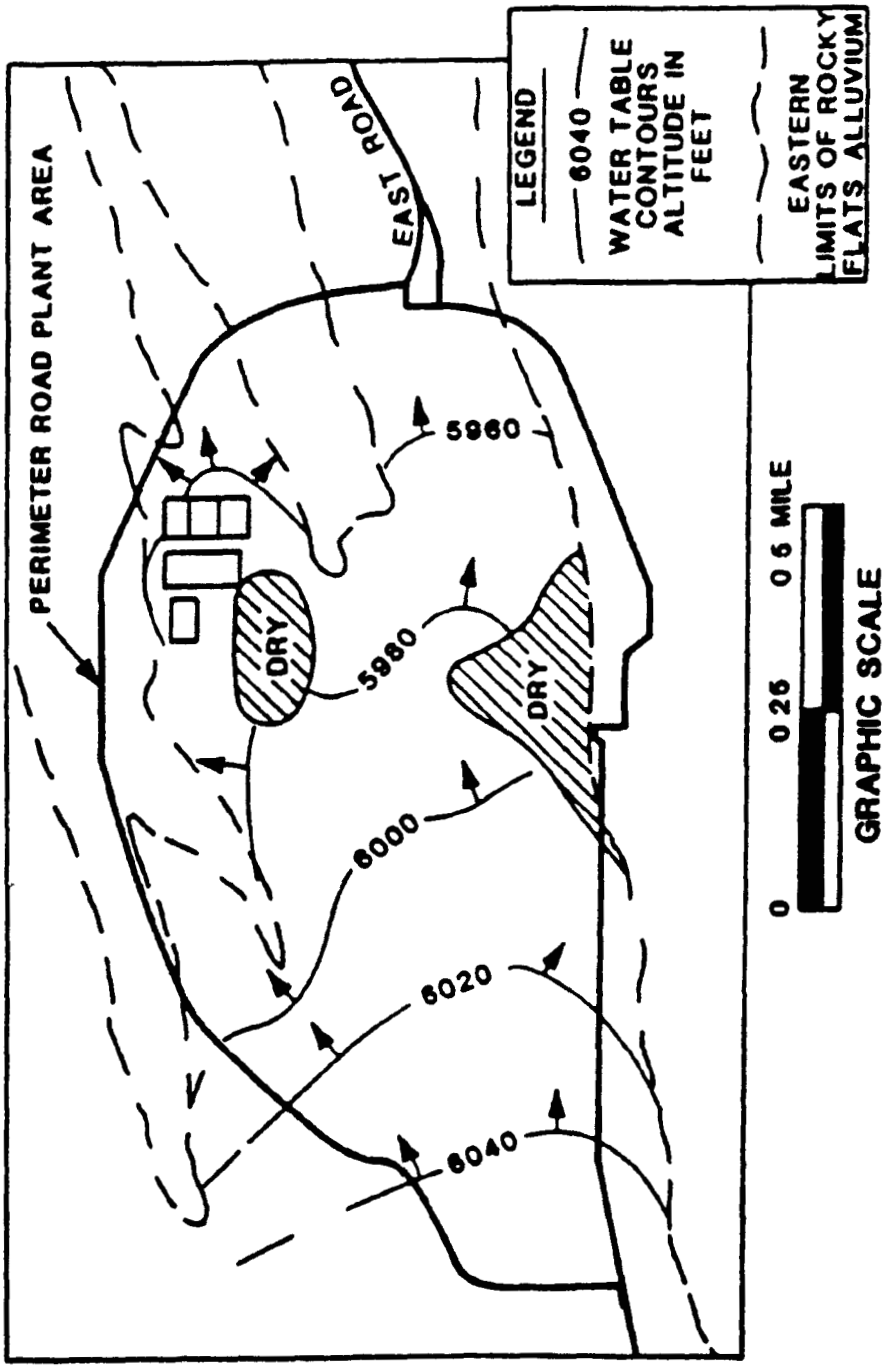

Figure III 4 Water Table Contour Map of the Rocky Flats Alluvium.

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Figure III 5. Bedrock Contour Map on the Top of the Arapahoe Formation.

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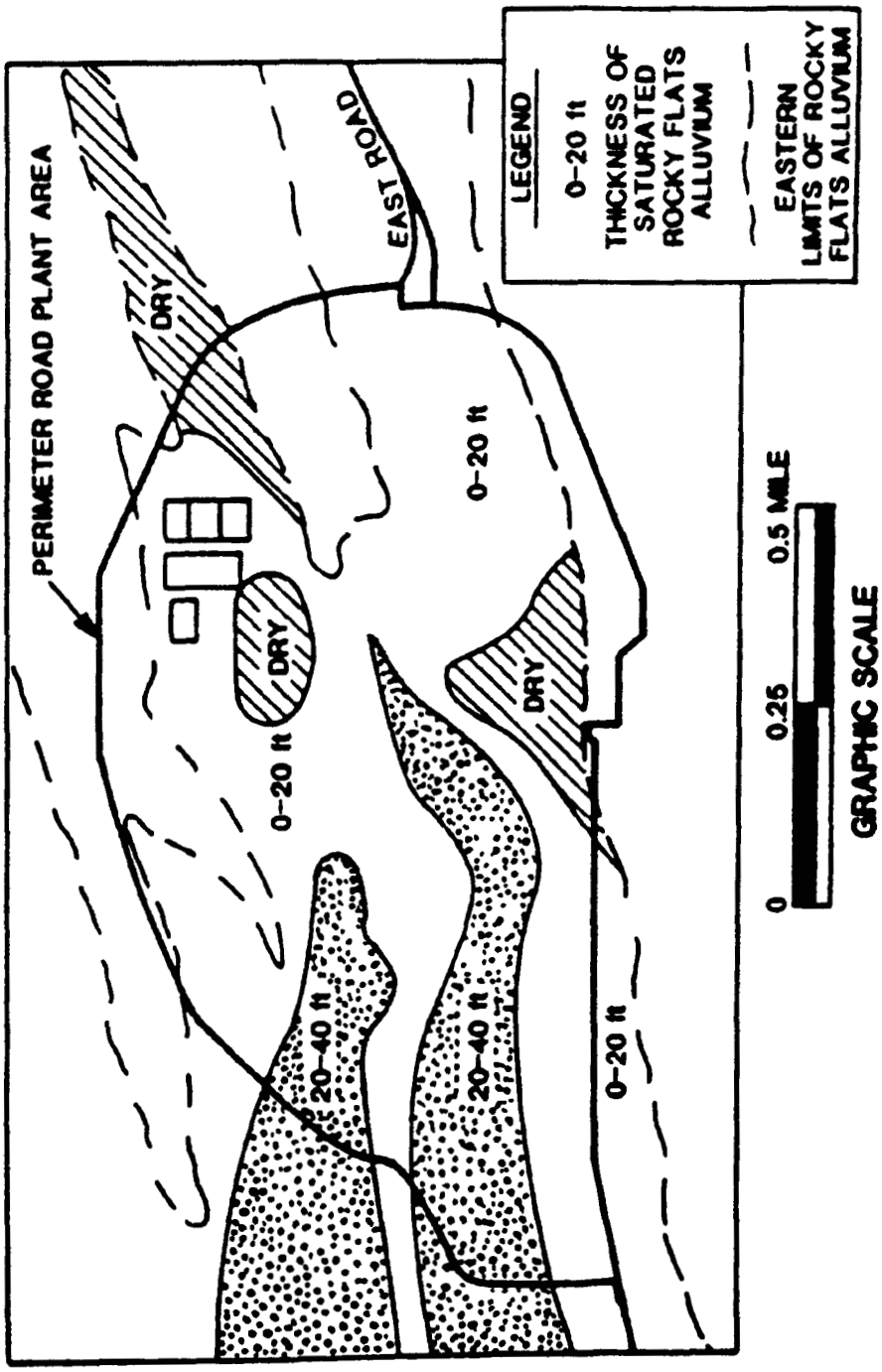

Figure III 6. Saturated Thickness Map of the Rocky Flats Alluvium

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III.D.2.a. Arapahoe Formation Permeable zones in the Arapahoe Formation contain small amounts of water recharged by water from the overlying Rocky Flats Alluvium The permeable zones are lenticular sands in the claystone Movement of water in the Arapahoe Formation is eastward Compared with the Rocky Flats Alluvium, the hydrologic conductivity of the Arapahoe is quite low, estimated at 0 3 to 0 4 ft/d Assuming a hydrologic gradient of about 0 3 and an effective porosity of 0 10, the pore velocity of water in the Arapahoe is about 0 1 ft/d (Hurr 1976) Data recently collected at Rocky Flats Plant indicate that the velocity of groundwater within the Arapahoe Formation could be lower (HS 1985)

III.D.2.b. Laramie-Fox Hills Aquifer The lower unit of the Laramie Formation and the Fox Hills Sandstones is collectively known as the Laramie-Fox Hills Aquifer These beds are steeply dipping along the western boundary of the plant and flatten quickly to the east in the area of the plant The aquifer is recharged from the limited surface area of the outcrop along the Front Range

The water in the aquifer is moving down-dip from west (zone of recharge) to east. The aquifer is under artesian conditions at the Wind Energy Test Facility in the northwest corner of the plant A well drilled into the Laramie-Fox Hills Aquifer has a standing water level of about 97 ft (the top of the aquifer is below 900 ft.) The aquifer is of low permeability with specific capacities ranging from 0 1 to 2 gpm/ft of drawdown

Operations at Rocky Flats Plant should result in little, if any, deterioration of water quality in this aquifer An approximately 800-ft sequence of claystone and then sandstone lenses of the Arapahoe Formation and shales of the upper part of the Laramie Formation overlie the aquifer. The claystone and shale restrict infiltration and recharge from the Rocky Flats Alluvium at the plant along the eastern margin of the bench.

III.E. Water Quality

Water quality data are presented for retention ponds with reference to the NPDES permit limitations, surface water and reservoirs, and groundwater. The data are available in the Rocky Flats Plant's Annual Environmental Monitoring Report (AEMR 1983), monthly reports, and the Rockwell International Environmental Analysis and Control Section's files.

III.E.1. Retention Ponds Discharges from the plant are monitored for compliance with the appropriate EPA NPDES permit limitations (EPA 1984) These discharges are to offsite sources, North Walnut, South Walnut, or Woman Creek (Fig III 3) The NPDES permit requires reporting when discharge occurs at any of seven designated outfalls, and requires analyses of the discharge. Applicable permit limitations and concentration guides before release are shown in Table III 1 along with the location of the seven designated outfalls

The previous NPDES permit (EPA 1981) became effective on May 20, 1981 and expired on June 30, 1984 This permit was given an extension to Dec. 26, 1984 The current permit became effective on Dec 26, 1984 and continues until Dec. 20, 1988.

From the initial date of the previous permit (May 20, 1981), monitoring the discharge for NPDES limitations resulted in no violations in 1981, 1982, or 1983 One technical violation occurred in 1984, and one in 1985 The 1984 technical violation was due to runoff from spray irrigation carrying nitrates into the McKay ditch and bypassing the plant's retention ponds. The measured levels of nitrates were below discharge limits through designated outfalls, however, the discharge did not go through a designated outfall The 1985 technical violation resulted when water was being transferred from retention pond B-3 to retention pond B-5 Measurements indicated that residual chlorine was slightly above discharge limits during transfer; however, none of the water was discharged from retention pond B-5 until the residual chlorine dropped to an acceptable level

During 1982, discharge was from ponds A-3, A-4, B-5, and C-2 Monitoring the discharge for NPDES limitations indicated no violations of the NPDES permit. Water from the reverse osmosis pilot plant and reverse osmosis operating plant had no discharge to offsite sources. Concentrations of plutonium, uranium, americium, and tritium in discharges from retention ponds A-4, B-5, C-1, and C-2 were 2 5% or less of the applicable Radioactivity Concentration Guide (DOE 1981).

Water samples have been collected monthly and composited quarterly from retention ponds B-4 and C-1. Data for year 1983 are presented in Table III.2. Retention pond C-1 has been isolated from plant operations for several years. Water from retention pond C-1 flows into Woman Creek and eventually into Standley Lake.

Table III-1 NPDES Permit Limitations and DOE Radioactivity Concentration Guides for Waterborne Effluents

NPDES Permit

EPA Designations	Discharge Locations Plant Designation	Drainage
Discharge 001	Pond B-3	Walnut Creek
Discharge 002	Pond A-3	Walnut Creek
Discharge 003	Reverse Osmosis Pilot Plant	Six Locations*
Discharge 004	Reverse Osmosis Plant	Pond B-3**
Discharge 005	Pond A-4	Walnut Creek
Discharge 006	Pond B-5	Walnut Creek
Discharge 007	Pond C-2	Woman Creek

Parameter	Discharge Limitation# Monthly Average	Daily Max	Reference
pH	6.0-9.0 SU	6.0-9.0 SU	NPDES Permit
Nitrate as N	10 mg/l	20 mg/l	NPDES Permit
Total Phosphorus	8 mg/l	NA	NPDES Permit
BOD, 5-day	10 mg/l	25 mg/l	NPDES Permit
Suspended Solids	30 mg/l	45 mg/l	NPDES Permit
Total Chromium	0.05 mg/l	0.1 mg/l	NPDES Permit
Residual Chlorine	NA	0.5 mg/l	NPDES Permit
Oil and Grease	NA	Visual	NPDES Permit
Fecal Coliform Count	400 organisms/100 mL	(7 day)	NPDES Permit
Fecal Coliform Count	200 organisms/100 mL	(30 day)	NPDES Permit
Total Organic Carbon	22 mg/l	30 mg/l	NPDES Permit

Radioactivity Concentration Guides

Parameter	Discharge Limit	Reference
Plutonium 239,240	<1,667 x 10-9 uCi/ml	DOE Order 5480.1
Uranium 233, 234, 238	200 x 10-9 uCi/ml	DOE Order 5480.1
Americium 241	<1,330 x 10-9 uCi/ml	DOE Order 5480.1
Tritium	<1,000 x 10-6 uCi/ml	DOE Order 5480.1

* May be operated at ponds A-3 and A-4 on North Walnut Creek, at Ponds B-4 and B-5 on South Walnut Creek, and ponds C-1 and C-1 on Woman Creek

** Sometimes to RO holding ponds and then spray irrigated onsite.

These limitations are presented as indicators of the types of parameters and associated concentration limits required by the NPDES permit. Details of these requirements specific to each discharge location are given in the referenced document.

Table III-2 Chemical Quality of Surface Water (1983)

Element	Retention Ponds			
	Pond B-4		Pond C-1	
(mg/l)	1st Qtr.	4th Qtr.	1st Qtr	4th Qtr.
Ag	0 0007	0 0007	0 0003	0 002
Al	0 7	0 4	0 3	0 5
As	<0 01	<0 05	<0 01	<0 05
B	0 07	0 1	0 02	0 09
Ba	<1	<1	<1	<1
Be	<0 05	<0 01	<0 05	<0 01
Bi	<0 002	<0 002	<0 0008	<0 0009
Ca	60	20	27	20
Cd	<0 01	<0 01	<0 01	<0 01
Ce	<0 3	<0 4	<0 2	<0 2
Co	<0 002	<0 002	<0 0008	<0 0009
Cr	<0 05	<0 05	<0 05	<0 05
Cs	<0 03	<0 04	0 02	0 02
Cu	0 3	0 007	0 02	0 05
Fe	1	0 1	0 3	0 2
Ge	<0 002	<0 002	<0 0008	<0 0009
Hg	<0 002	<0 002	<0 002	<0 002
K	1 6	25	1 1	15
Li	0 07	0 03	0 05	0 01
Mg	19	13	6 8	5
Mn	0 2	0 14	0 02	0 03
Mo	0 001	0 001	0 0005	0 0002
Na	41	40	22	20
Nb	<0 02	<0 02	<0 008	<0 009
Ni	0 003	0 007	0 002	0 009
P	<0 02	<0 02	<0 008	<0 009
Pb	0 002	0 0007	0 0005	0 0005
Rb	<0 03	<0 04	<0 02	<0 02
Sb	<0 003	<0 004	<0 002	<0 002
Se	<0 01	<0 01	<0 01	<0 01
Si	4 1	3 9	7 3	6 2
Sn	<0 003	<0 004	<0 002	<0 002
Sr	0 7	0 3	0 2	0 1
Ta	<0.003	<0 004	<0 002	<0 002
Te	<0.03	<0.04	<0 02	<0 02
Th	<0 003	<0 004	<0 002	<0 002
Ti	0 03	0 02	0 02	0 02
Tl	<0 002	<0 002	<0 0008	<0 0009
U	<0.2	<0 2	<0 08	<0 09
V	<0.003	<0.004	<0 002	<0 002
W	<0.2	<0.2	<0 08	<0 09
Zn	0 2	0 02	0 01	0 02
Zr	<0 003	<0 004	<0.002	<0 002
TDS	349	357	162	171
Atrazine (ug/l)	0 4			

Table III-2 Chemical Quality of Surface Water (1983) (con)

Surface Water and Reservoirs

Element (mg/l)	Walnut Creek at Indiana 1st Qtr.	4th Qtr.	Great Western Reservoir 1st Qtr	Standley Reservoir 4th Qtr.
Ag	<0 0004	0 0006	0 0002	0 0002
Al	0 7	>3	0 4	0 09
As	>0 01	<0 05	<0 01	<0 01
B	0 04	0 1	0 05	0 02
Ba	<1	<1	<1	<1
Be	<0 05	<0 01	<0 05	<0 05
Bi	<0 002	<0 002	<0 0006	<0 0006
Ca	58	15	32	30
Cd	<0 01	<0 01	<0 01	<0 01
Ce	<0 4	<0 3	<0 1	<0 1
Co	<0 002	<0 002	<0 0006	<0 0006
Cr	<0 05	<0 05	<0 05	<0 05
Cs	<0 04	0 03	0 01	0 01
Cu	0 03	0 01	0 01	0 01
Fe	0 3	1	0 1	0 05
Ge	<0 002	<0 002	<0 0006	<0 0006
Hg	<0 002	<0 002	<0 002	<0 002
K	2	25	1 6	1 4
Li	0 2	0 06	0 06	0 07
Mg	18	10	6 1	5.7
Mn	0 03	0 06	0 008	0 007
Mo	0 0007	0 0006	0 01	0 01
Na	46	35	17	12
Nb	<0 02	<0 02	<0 006	<0 006
Ni	0 004	0 009	0 006	0 01
P	<0 02	<0.02	<0 006	0 006
Pb	0 001	0 001	0 0005	0 0006
Rb	<0.04	<0 03	<0 01	<0 01
Sb	<0 004	<0 003	<0 001	<0 001
Se	<0 01	<0 01	<0 01	<0 01
Si	3 6	4 8	1 5	0 6
Sn	<0 004	<0 003	<0 001	<0 001
Sr	0 3	0 3	0 08	0 09
Ta	<0 004	<0 003	<0 001	<0 001
Te	<0 04	<0 03	<0 01	<0 01
Th	<0 004	<0 003	<0 001	<0 001
Ti	0 03	0 1	0 01	0 005
Tl	<0.0002	<0 0002	<0 0006	<0 0006
U	<0.2	<0 2	<0 06	<0.06
V	<0 004	0 009	<0 001	<0.001
W	<0.2	<0 2	<0 06	<0.06
Zn	0 02	0 06	0 007	<0 006
Zr	<0 004	0.006	<0 001	<0 001
TDS	372	316	121	123
Atrazine (ug/l)	<0 2			

Because biocides are used for pest and weed control on the plant site, samples are collected and analyzed from retention ponds B-4 and C-1 during biocide application Analytical results for 2, 4-D and Bromacil have been less than 2 ppb The recommended limit is 100 ppb (AEMR 1983) (See Sec. V B 3 c for a discussion of biocides)

Polychlorinated biphenyls (PCBs) are stored at the plant and are present in some transformer oils and hydraulic systems, each in accordance with EPA Guidance Analytical results of downstream water in 1982, 1983, and 1984 show no detectable concentrations of PCBs above the analytical detection limit of about 1 ppb (AEMR 1983, 1984, 1985) (See Sec V B 3 a for a discussion of PCBs)

III.E.2. Surface Water and Reservoirs Surface water from Walnut Creek at Indiana Street is collected and analyzed for chemical and radiochemical constituents during periods of streamflow Samples analyzed for plutonium, americium, and tritium show concentrations less than 1% of the Radioactivity Concentration Guide (DOE 1981) for water, whereas uranium concentrations were about 2 5% of the Radioactivity Concentration Guide for water.

The chemical quality of water from Walnut Creek at Indiana Street is shown in Table III 2 for the 1st and 4th quarters of 1983 Chemical quality of water for the 1st quarter from Great Western Reservoir and Standley Lake is also shown in Table III 2. The concentrations indicate no contamination of surface water.

III.E.3. Groundwater Groundwater in the Rocky Flats Alluvium and in the Arapahoe Formation is monitored through a series of 56 observation wells (Fig III 7) The wells are located throughout the area of the plant to monitor retention ponds, evaporation ponds, spray irrigation application west of the plant, burial trenches, and sanitary landfills. The wells range in depth from 10 to 258 ft.

Examples of data for select chemical constituents (Ca, Mg, Na, F, Cl, N, and TDS) in water from wells are shown in Table III 3. Depth of wells is also found in the table.

Nitrate concentrations are present above drinking water standards in the retention ponds, solar ponds, and in effluent used for spray application as irrigation in an area on the western portion of the plant site. Nitrates above drinking water standards also occur in the alluvium near the 207 Solar Evaporation Ponds and at locations in the eastern portion (Table III 3). The spray application is designed to reduce the volume of nitrate

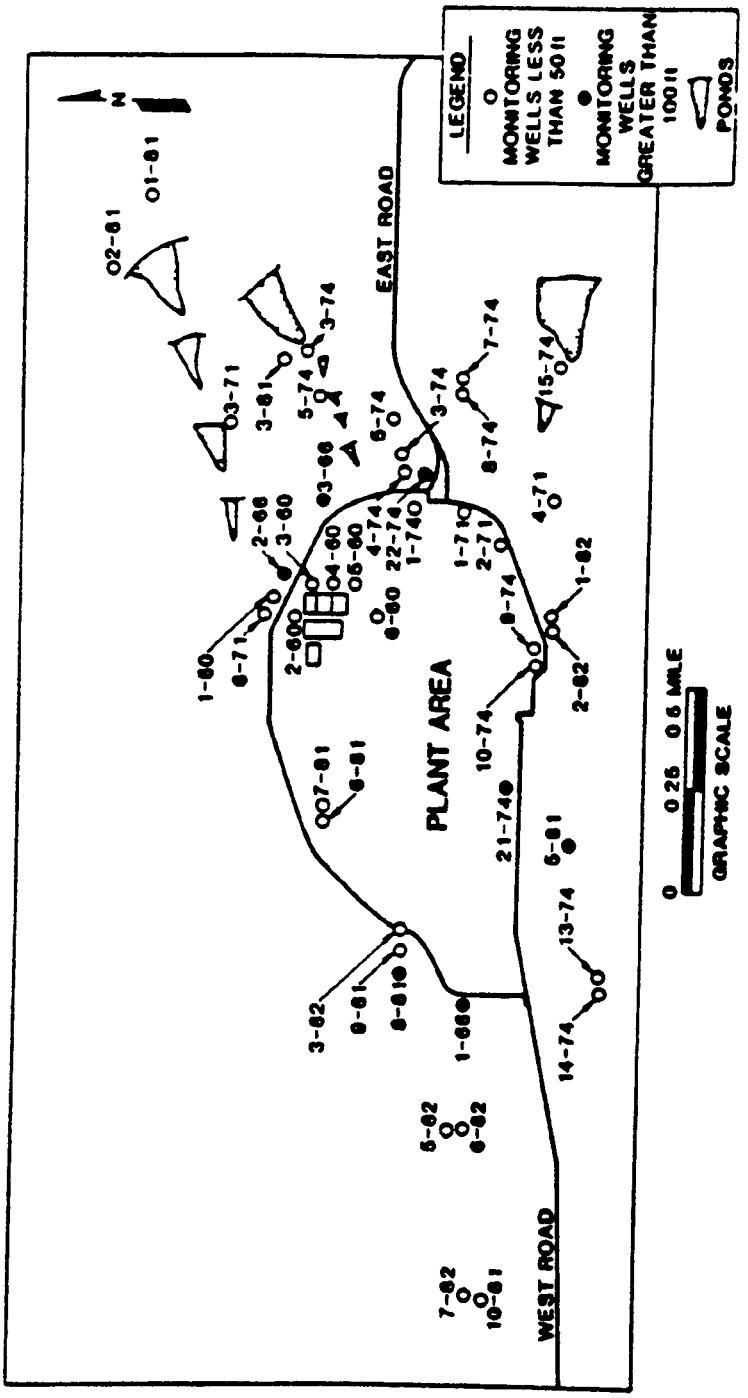

Figure III 7 Location of Observation Wells in and Adjacent to the Plant Area

not used

Table III 3 Chemical Constituents in Water from Observation Wells *

Well** Number	Depth (ft)	(mg/l) Ca	Mg	Na	F	Cl	N	TDS
1-60	26	390	170	190	0 4	68	200	2533
2-60	23	740	270	730	0 4	438	747	7570
3-60	20	95	25	60	0 4	6	3	475
4-60	18	120	30	170	0 7	6	67	1020
5-60	19	100	20	40	0 4	12	18	494
6-60	29	80	25	25	<0 2	-	3	321
1-66	152	20	5	10	0 3	2	3	110
2-66	140	55	15	30	0 3	103	23	393
3-66	145	55	20	100	0 7	134	2	542
1-71	29	50	15	15	0 4	20	4	230
2-71	29	7	4	140	0 4	48	11	517
3-71	31	95	40	250	0 4	120	< 1	1340
4-71	22	20	7	45	0 3	15	< 1	280
5-71	28	200	35	130	0 4	-	< 1	1350
6-71	61	410	85	180	0 4	4	344	2990
1-74	24	190	10	6	0 4	8	12	395
3-74	24	75	10	35	0 6	15	7	176
5-74	19	25	5	5	-	7	-	385
7-74	50	85	15	10	0 4	-	13	405
8-74	40	75	8	10	0 4	43	8	332
9-74	19	220	35	80	0 4	66	11	1070
10-74	10	380	85	170	0 6	11	64	2360
13-74	19	60	20	75	0 4	27	< 1	498
14-74	5	40	5	25	-	1	-1	159
15-74	19	190	35	80	0 4	77	< 1	890
17-74	14	650	140	320	0 4	720	< 1	3180
21-74	258	15	4	45	0 3	6	< 1	186
22-74	199	50	15	40	0 3	-	6	349
1-81	20	50	30	170	0 4	117	< 1	852
2-81	20	55	35	60	0 4	51	2	766
3-81	21	240	80	360	0 3	200	14	2350
5-81	20	120	30	75	0 4	45	< 1	775
6-81	31	55	15	35	0 3	8	1	305
7-81	29	10	10	20	0 2	4	1	277
8-81	100	20	4	20	0 4	-	< 1	125
9-81	31	30	< 1	25	0 3	-	< 1	100
10-81	30	20	3	15	<0 2	44	7	108
1-82	20	90	30	150	0 7	55	< 1	820
2-82	10	50	15	125	0 5	-	5	513
3-82	27	35	4	15	<0 1	-	5	144
5-82	30	40	3	25	<0 1	11	2	213
6-82	31	30	2	6	0 2	1	< 1	83
7-82	22	40	5	15	0 4	2	< 1	139

* This data is from quarterly samples taken from October 1983.
** The last two digits indicate the year of well construction

effluents in the retention ponds and to control nitrates in offsite discharges to concentrations that meet the NPDES limitations The rate of nitrate application is within the range typically used for agricultural fertilization

Elevated values for total dissolved solids (TDS) appear in wells where elevated nitrate concentrations were observed, however, a few wells in the drainage of North and South Walnut Creek and Woman Creek east of the retention ponds also contained TDS in excess of 500 mg/L This is the national drinking water standard and is used as a baseline value by EPA to determine the extent of groundwater monitoring under RCRA regulations

In March and April 1985, groundwater samples taken from onsite monitoring wells were determined to contain volatile organic compounds (i e, trichloroethylene, tetrachloroethylene, 1,1-dichloroethylene, and 1,1,1-trichloroethane) A complete characterization of this contamination plume is currently being performed.

III.F. Air Quality

Rockwell International's operations are considered to be a minor source of air pollution in the greater Boulder-Denver metropolitan area. Based on air quality monitoring data, Rockwell International operations appear to be in compliance with state and federal air pollution regulations, however, the total plant emission of volatile organic compounds to the atmosphere is not well defined The Denver metropolitan area is a nonattainment area for ozone. Rockwell International is not considered to be a cause of the nonattainment Discussion of atmospheric releases from Rocky Flats Plant is presented in Sec. V B 4 a.

III.G. Environmentally Sensitive Conditions

There are no known environmentally sensitive conditions such as critical habitats for threatened or endangered species as identified in 50 CFR Part 402 or wetlands greater than 5 acres in size as defined in Executive Order 11990 near Rocky Flats Plant that warrant attention under the HRS evaluation (see Appendix B). However, small areas around the stream channels, retention ponds, seeps, and springs appear to qualify as wetlands, and may require wetland assessments when impacted by future plant operations.

IV ENVIRONMENTAL LAWS APPLICABLE TO ROCKY FLATS PLANT

The Department of Energy (DOE), its predecessors, and operating contractors were in operation long before the present environmental laws were enacted During this time, DOE, its predecessors, and contractors were guided by internal guidelines and standards and by the Atomic Energy Act of 1954 with regard to pollution and radiation control

Presently, DOE and its operating contractors are guided by the existing applicable environmental laws and by DOE orders. Rocky Flats Plant's compliance with the environmental laws that apply to its facility is discussed below

IV.A. Comprehensive Environmental Response, Compensation, and Liability Act

Current CERCLA regulations address inactive waste sites from the standpoint of hazardous and toxic substances Potential CERCLA sites are identified in Section V A Some of the sites identified may be considered to be continuing release sites under the RCRA. Sites are given a numerical hazardous ranking based on various site and waste characteristics. Sites that receive a numerical Hazard Ranking System (HRS) Migration Mode score above the value of 28 5 are included on the National Priorities List (NPL) for clean-up Effective Feb 18, 1986, federal facilities may be included on the NPL. The HRS Migration Mode scores for Rocky Flats Plant are presented in Sec. V A and in Appendix B Because some of the sites received scores greater than the threshold value of 28 5, the Rocky Flats Plant may be included on the NPL

In addition, CERCLA requires reporting releases of hazardous substances from facilities that exceed reportable quantities, as specified in 40 CFR 302. Policy for reporting events of this kind has been established at Rocky Flats Plant. Procedures will be included in the spill prevention control and countermeasure plan (SPCC).

IV.B. Resource Conservation and Recovery Act

This act establishes the authority to regulate solid wastes including nonhazardous solid waste, hazardous chemical waste, recycling operations, and underground storage tanks The State of Colorado has received authorization for RCRA programs except for the 1984 amendments.

The Rocky Flats Plant operates a landfill for the disposal of nonradioactive nonhazardous waste and generates a variety of hazardous chemical and/or radioactive wastes Landfill operations and management of hazardous chemical wastes are regulated under the RCRA as indicated below

IV.B.1. Guidelines for the Land Disposal of Solid Waste (40 CFR 241)/Colorado Solid Waste Disposal Sites and Facilities Law/Colorado Waste Facility Siting Rules. Colorado regulations set minimum standards for landfills and require a certificate of designation from the local county to operate a nonradioactive nonhazardous solid waste disposal facility In January 1979, the State of Colorado Department of Health (CDH) inspected the present landfill at the Rocky Flats Plant and filed a landfill acceptance letter stating that the landfill complied with minimum standards and did not need a certificate of designation (CDH 1979) Standard operating practices for the present landfill are in accordance with the requirements of federal and state regulations However, small quantities of radionuclides and hazardous chemicals may be in the landfill from past disposal practices and/or occasional errors in segregating wastes (see Sec V A 3.c).

IV.B.2. Colorado Hazardous Waste Notification and Permit Rules These rules require facilities to prepare RCRA Part A and Part B applications for state-issued RCRA permits. The applications must describe in detail how hazardous wastes are managed at the facility A revised Part A was submitted to the state and to EPA in May 1985, and the Part B was submitted on Nov 1, 1985

On Nov 20 1985, the CDH notified the Rocky Flats Plant of its intent to deny the Part B permit unless certain specified information was provided to CDH by Dec. 3, 1985 On Dec 4, 1985, CDH issued a notice of intent to terminate interim status and to deny a state hazardous waste Part B permit application for hazardous waste treatment, storage, and disposal at the Rocky Flats Plant. The tentative denial is based on failure to provide requested information on: (1) groundwater contamination, (2) management of mixtures of radioactive and hazardous chemical waste, and (3) groundwater monitoring (CDH 1986)

IV.B.3. Colorado Hazardous Waste Act/Colorado Hazardous Waste Management Regulations/Colorado Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities. The Colorado Hazardous Waste Act, Colorado Hazardous Waste Management Regulations, and the Colorado Standards for

Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities provide the Colorado implementation of RCRA hazardous waste programs as outlined in 40 CFR 260-267 These regulations outline the requirements for generators, transporters, and owners of treatment, storage, and disposal facilities that handle hazardous chemical waste Source, special nuclear, and by-product materials as defined by the Atomic Energy Act are excluded from these regulations However, mixtures of hazardous chemical waste and other types of solid waste are subject to Colorado's hazardous waste regulations

The Rocky Flats Plant generates a variety of radioactive and hazardous chemical wastes including by-product materials (radioactive materials either directly yielded in the process, or made radioactive as a direct and necessary consequence of the process of producing or utilizing special nuclear material (50 FR 45736)), candidate mixed wastes (non-by-product wastes that, because of the process by which they are generated, inherently contain both radionuclides and EPA-listed hazardous chemicals), and nonradioactive hazardous chemical wastes (waste that contains an EPA-listed constituent or that has an EPA hazard characteristic) While some of these wastes are managed individually, others are mixed together within the waste treatment process and handled as a single waste unit The generation of candidate mixed waste and the deliberate mixing of different waste streams (see Sec. V.B 2.b) present some regulatory concerns. The management jurisdiction of candidate mixed wastes between DOE, EPA, and the state needs to be resolved In addition, the deliberate mixing of RCRA-regulated waste with by-product material and/or candidate mixed wastes needs to be evaluated to determine whether waste streams should continue to be mixed and the resulting waste possibly regulated under RCRA, or whether the waste streams should be segregated and managed individually as by-product waste and RCRA-regulated waste. Once a determination has been made as to which processes will handle RCRA-regulated waste, the facilities and processes used to treat RCRA-regulated waste will need to be evaluated for compliance with RCRA standards.

IV.B.4 1984 RCRA Amendments. The 1984 RCRA amendments added some additional hazardous waste management requirements including: (1) making a biennial inventory of federal facility hazardous waste activities; (2) taking an inventory of underground storage tanks that contain petroleum and CERCLA hazardous substances; (3) retrofitting interim status surface impoundments to comply with the double-liner, leachate collection and groundwater monitoring requirements, or terminating their use.

The Rocky Flats Plant submitted an inventory of hazardous waste activities in January 1986, and they are currently compiling an inventory of underground storage tanks to meet the May 1986 reporting requirements to EPA

IV.C. Toxic Substances Control Act

This act establishes a list of chemicals defined as toxic, for which the manufacture, uses, storage, handling, and disposition are regulated This act specifically identifies PCBs and requires that all use of PCBs be in a "totally enclosed manner" to ensure that exposure of human beings or the environment to PCBs will be insignificant All items containing PCBs at the plant are marked in accordance with TSCA regulations, and all PCBs awaiting disposal are stored in approved locations. Currently, several drums of noncombustible, solid, radioactive PCB- contaminated material (metals) are in storage at the plant This waste will be shipped offsite for disposal when an EPA-approved disposal technology is developed for this type of material (see Sec V B 3 a) Storage is in accordance with the TSCA requirements for PCB-containing items

IV.D. Clean Air Act

The Clean Air Act sets national policy to maintain air quality and control air pollution The EPA has established National Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants (NESHAPS), New Source Performance Standards (NSPS), and regulations for visibility protection and Prevention of Significant Deterioration (PSD) of air quality The NAAQS, NESHAPS, NSPS, and PSD requirements are implemented in Colorado through the State Implementation Plan (SIP) as indicated in the following sections.

IV.D.1. Colorado's Air Quality Control Act. This act establishes State of Colorado policy and authority to implement the SIP and to control air pollution by promulgating regulations.

IV.D.2. Colorado's Ambient Air Quality Standards. These standards implement the NAAQS for Colorado and set maximum contaminant levels for ambient air concentrations of total suspended particulates, sulfur dioxide, oxidant (ozone), carbon monoxide, and nitrogen dioxide. The Denver metropolitan area is a nonattainment area for ozone, carbon monoxide, and total suspended particulates.

The Rocky Flats Plant conducts a monitoring program for total suspended particulates, sulfur dioxide, ozone, carbon monoxide, and nitrogen dioxide (Sec V B 5 a) The monitoring data are summarized in the annual environmental monitoring reports, and indicate compliance with all ambient standards except ozone Ozone concentrations are typical of levels found in the Denver metropolitan area This regional photochemical oxidant problem is believed to be caused by urban transportation sources

IV.D.3. Colorado's Air Pollution Control Regulations The Colorado Air Pollution Control Regulations establish emission control regulations and emission monitoring requirements to achieve and maintain air quality, including. (1) implementation of the NAAQS for lead and NESHAPS for asbestos, mercury, and beryllium, (2) specification of new source performance standards, PSD review requirements, and regulations for preserving Class I visibility, and (3) regulation of emissions of volatile organic compounds (VOCs) that contribute to ozone formation The use of solvents for cleaning/degreasing is carefully regulated, and disposal of VOCs by evaporation or spillage in quantities exceeding 10 gal is prohibited in nonattainment areas.

The regulations also require owners to file an Air Pollution Emission Notice (APEN) and obtain an emission permit for new facilities (constructed after Feb 1, 1972) that will emit air pollutants and for facilities with significant changes in air emissions The permits define control strategies and set emission limits to prevent deterioration of air quality.

The Rocky Flats Plant (contractor and subcontractors) complies with state implementation of NESHAPS by (1) providing notice to the state for asbestos demolition activities and conforming to specific requirements for asbestos handling, and (2) controlling and monitoring releases of beryllium from the beryllium shop in accordance with state emission and reporting requirements. The plant also files APENs with the state for plant emission sources, submits required air monitoring data to the state in the annual environmental monitoring report, and conducts a vehicle inspection program for plant vehicles.

A complete inventory of VOC emissions from plant operations, including the air sparge (evaporation) disposal of carbon tetrachloride, should be conducted to determine whether VOC releases exceed the VOC emission standard for nonattainment areas.

IV.E. Clean Water Act

The CWA establishes national authority to maintain water quality and control water pollution Effluent releases to surface waters are regulated through the National Pollutant Discharge Elimination System (NPDES) program The NPDES program for the State of Colorado is administered by the EPA, Region VIII Other water quality control programs are administered by the State of Colorado

IV.E.1. National Pollutant Discharge Elimination System Rocky Flats Plant has a NPDES permit that covers seven outfalls from the plant (outfalls 001, 004, and 006 to South Walnut Creek, outfalls 002 and 005 to North Walnut Creek; outfall 007 to Woman Creek, and outfall 003, a mobile outfall from the reverse osmosis pilot plant that may be operated at ponds A-3 and A-4 on North Walnut Creek, at ponds B-4 and B-5 on South Walnut Creek, and ponds C-1 and C-2 on Woman Creek) This permit gives specific limits for each outfall tailored to the upstream inputs The current Rocky Flats NPDES permit (effective Dec. 26, 1984) is issued and permitted by the Environmental Protection Agency, Region VIII, and is listed as permit number CO-0001333.

New NPDES permit regulations promulgated on Sept. 26, 1984, require that all storm-water discharges from point sources (defined to include pipes, conduits, ditches, and channels) must be covered by NPDES permit. The original effective date for application of Oct 26, 1984 has been delayed until Dec 31, 1987 for Group I and June 30, 1989 for Group II (50 FR 35200)

IV.E.2. Colorado's Water Quality Control Act/Colorado's Discharge Permit System Regulations. The act and regulations provide the state authority for implementing the NPDES program in the state of Colorado. NPDES permits issued by the EPA are sufficient to satisfy state requirements.

IV.E.3. Colorado's Water Quality Control Regulations/Colorado's Water Quality Standards. The regulations and standards establish effluent limitations and basic standards to prevent degradation of state waters. The standards prohibit any increase in radioactive materials in groundwater over naturally occurring concentrations without an approved exemption by the state. They also stipulate maximum radionuclide (Cs-134, Pu-238, Pu-239, Pu-240, Ra-226, Ra-228, Sr-90, Th-230, Th-232, and H-3) concentrations for surface waters. Concentrations of toxic materials in state waters must not preclude bene-

ficial use of the water Measured surface water concentrations of radionuclides from the plant are below applicable standards Plutonium at low concentrations has been detected in the groundwater (see Sec V B 5)

IV.F. Safe Drinking Water Act

The Safe Drinking Water Act establishes drinking water standards for public drinking water systems (40 CFR 141) and provides for the protection of underground drinking water sources.

The Rocky Flats Plant receives domestic supply water from Ralston Reservoir and the South Boulder Diversion Canal Water is treated at a water treatment plant onsite (Sec V B 2 e) and is tested in accordance with the requirements for public drinking water systems The domestic water supply at the plant routinely meets all the national interim primary drinking water standards

IV.G. Federal Insecticide, Fungicide, and Rodenticide Act

This act, as amended, contains federal regulations governing the manufacture and use of biocides. Promulgated under this act, 40 CFR 162 provides the registration procedures and identifies restricted use pesticides, and 40 CFR 165 establishes the recommended procedures for disposing of and storing pesticide containers and residues. The State of Colorado has also enacted legislation governing the use of pesticides and the certification of pesticide applicators.

The use of biocides at the plant is accomplished in accordance with both state and federal regulations (Sec. V.B 3.c). A 1984 appraisal by the DOE of the plant's practices resulted in changes in procedures to ensure proper administrative control.

IV.H. National Environmental Policy Act

The National Environmental Policy Act requires preparation of environmental impact analyses for all federal actions that may adversely affect the environment. DOE Order 5440.1C and AL Order 5440.1B implement the NEPA requirements for DOE facilities under its jurisdiction.

In accordance with the requirements of AL 5440 1B, the Rocky Flats Plant prepares an action description memorandum (ADM) as part of the funding cycle for all major

projects implemented at the plant The ADMs are reviewed by the Safety Analysis and Facility Engineering groups at the plant, and submitted to the Budget Office for transmission to the DOE Area Office, DOE-AL, and DOE-HQ DOE makes the determination of whether further NEPA documentation is needed One environmental impact statement (EIS), which covers routine plant operations, was prepared for the Rocky Flats Plant (RFEIS 1980) Subsequent ADMs have been tiered to the EIS In addition to the ADM process, other construction activities are also reviewed by the Safety Analysis and Facility Engineering groups at the plant to evaluate health, safety, and environmental concerns

IV.I. National Historic Preservation Act

Four sites have been identified that may require evaluation under provisions of the National Historic Preservation Act; the Lindsay Ranch site, an old railroad bed circa 1880, a stone house circa 1900, and the Antelope Springs site Historic review procedures need to be established for the Rocky Flats Plant. They may be included as part of the NEPA review process, as appropriate.

IV.J. Compliance with Floodplain/Wetlands Environmental Review Requirements

The DOE compliance with Floodplain/Wetlands Environmental Review Requirements as promulgated in 10 CFR 1022, requires proper documentation of any action impacting a wetland. This documentation includes publishing a notice in the Federal Register and subsequently preparing a Floodplain/Wetland Assessment The Floodplain/Wetland Assessment may be a separate document or a section within a NEPA document such as an Environmental Assessment (EA) or Environmental Impact Statement (EIS) Floodplain/Wetland Assessments have not been prepared in the past for operations at Rocky Flats Plant; however, since small areas adjacent to seeps, springs, and water courses may qualify as wetlands, future actions at the plant may require such an evaluation

IV.K. National Dam Inspection Act

This act, passed by Congress in 1972 (PL 92-367), established a comprehensive national program to inspect and regulate dams for safety purposes. Responsibility under the law was delegated to the Army Corps of Engineers. The Office of the State Engineer, Division of Water Resources sent a letter to DOE on Feb. 21, 1984 expressing concern over high water in holding pond dams from snowmelt. This letter quoted state statutes 37-87-

104 promulgated in 1973 that make owners of reservoirs liable for flood damage (from leakage or overflow) In accordance with the requirements, DOE has had the Army Corps of Engineers (Omaha Office) conduct periodic inspections of all dams on plant property To date, all of the dams have passed inspection

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V FINDINGS AND PLANNED FUTURE ACTIONS

This chapter is divided into two parts Section V A discusses all sites the CEARP Phase I review process identified as having known or possible contamination and the potential to release contaminants into the environment Section V B presents an overview of waste generation activities, waste management activities, and potential pathways for environmental release

V.A. Potential CERCLA Sites - Inactive or Former Disposal Facilities, Activities, Spills and Leaks

Potential CERCLA sites identified during CEARP Phase I (the equivalent of DOE CERCLA Order Phase I) are presented in this section. The CEARP findings are presented based on a negative, positive, or uncertain finding for the following EPA CERCLA program elements: (1) Federal Facilities Site Discovery and Identification Findings (FFSDIF) and (2) Preliminary Assessments (PA), Site Inspections (SI) [SI in CEARP is a preliminary SI (PSI)], and Hazard Ranking System (HRS) evaluation [including the DOE modified HRS (MHRS) evaluation]. The HRS and MHRS evaluations are presented in Appendix B. During the supplemental portion of CEARP Phase I, the locations of all sites determined to require further investigation will be mapped. In addition, reconnaissance field data will be collected so that HRS/MHRS evaluations can be performed for those sites currently lacking sufficient information to be scored.

Many of the identified sites warrant further action in terms of site characterization under CEARP Phase II. The actual investigational techniques to be used will be determined during the initial Phase II efforts, and the result will be a detailed monitoring plan This effort will include some simple preliminary site characterization that will define land surface characteristics, soil types, and underlying rock using field inspection and additional interpretation of published reports. In addition to surface and groundwater pathway investigations (Sec. V B.4.b and V.B.4 c), the detailed site characterization may include any and all of the following:

(1) Site Size and Location. Various geophysical techniques, such as resistivity, magnetic survey, ground penetrating radar, side-scan radar, core drilling, and logging of test holes, will be used as appropriate to determine the physical dimensions of a site.

(2) Characterization of Site Contents. An analysis of surface and subsurface samples will be made to determine the source term of hazardous substances contained at a site Parameters of interest could include any and all materials recognized as hazardous, including organics, metals, solvents, and radioisotopes. The specification of analyses to be performed will be based on information about what was or may have been disposed of at the site as well as some screening for a full range of potential contaminants of concern Samples to be taken may be from surface water, groundwater, sediments, cores from boreholes, vapors, or other media considered important The methodology for all sampling and analyses will conform to protocols and quality assurance requirements specified by EPA or DOE where appropriate.

(3) Characterization of Existing or Potential Migration Pathways. A variety of geohydrologic and analytical techniques will be used to determine the presence or absence of existing migration and the potential for future migration of contaminants away from sites confirmed to contain a source of concern. This investigation will determine the quantity of contaminants already in the pathway, using some of the techniques already mentioned. It will verify or obtain information on pathway parameters in the immediate vicinity of the site to enable estimates to be made of the potential for future migration and of the likely receptors of this migration.

V.A.1. Inactive, Isolated Sites. Based on a detailed records search, preliminary site inspection, and interviews with plant employees, inactive sites at Rocky Flats Plant were placed into three categories: (1) areas that might have received radioactive waste or contamination, (2) areas that might have received both radioactive and hazardous chemical wastes or contamination, and (3) areas that might have received nonradioactive hazardous chemical wastes or contamination.

V.A.2. Sites with Possible Radioactive Waste or Contamination. Rockwell International performed an onsite radiometric survey from 1975 to 1983 to locate and remove surface radioactive contamination from areas outside of buildings. Any radioactive material identified was subsequently removed. All locations found to have materials above background levels (except for several isolated locations within the 900 Area) have been decontaminated. All materials removed were packaged as radioactive waste and shipped offsite for disposal. Contamination from many of the sites listed below was removed during this survey work. Records of the operation exist as monthly memos-to-file, a detailed summary will be prepared during CEARP Phase II (Sec. V B 6 c). The phrase

"the radiometric survey" in this report refers to this 1975-1983 survey and decontamination operation

Table V-1 lists all buildings at Rocky Flats Plant that contain radioactive materials All of these buildings are currently being used Table V-2 lists potential CERCLA sites at the plant identified as having contained radioactivity These sites are discussed in the same order as they are listed in Table V-2.

Persons interviewed during CEARP Phase I mentioned that most of the buildings, identified in Table V-1, may have radioactive contamination underneath them and in some cases, radioactive contamination may exist in the buildings' footing drains Because these buildings are in use, no action will be taken until a building is removed. Then the area underneath the building will be monitored and decontaminated as appropriate However, during CEARP Phase II, this contamination will be studied for potential releases through the various pathways under existing conditions and appropriate action will be taken if required.

V.A.2.a. Radioactive Soil Burial, 300 Area. Persons interviewed mentioned that some low-level radioactively contaminated soil, collected from around Building 774, is now covered by the Building 334 parking lot. The person responsible for removing the soil indicated that it was removed prior to constructing the parking lot and was placed east of the 207 solar evaporation ponds within the 900 Area (PC 1985a).

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.2.b. Radioactive Site, 400 Area. Prior to 1973, ground areas around Building 444 and around Building 442 were known to contain very low levels of uranium (Owen 1973) Surface radioactivity was removed down to background levels during the radiometric survey.

Table V-1 Buildings Containing Radioactive Materials

Building	Facility Designation	Principal Element
371	Plutonium Recovery	Plutonium
374	Waste Treatment	Plutonium
444	Manufacturing	Uranium
447	Manufacturing	Uranium
559	Plutonium Analytical Laboratory	Plutonium
707	Manufacturing	Plutonium
771	Plutonium Recovery	Plutonium
774	Waste Treatment	Plutonium
776	Manufacturing	Plutonium
777	Assembly	Plutonium
779	Plutonium Development	Plutonium
865	Materials Development Laboratory	Uranium
881	Manufacturing	Uranium
883	Rolling and Forming Facility	Uranium
886	Nuclear Safety Facility	Plutonium
889	Decontamination Facility	Uranium
991	Research and Development	Plutonium

Table V.2 Potential CERCLA Sites Identified During CEARP Phase I with Possible Radioactive Waste or Contamination

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSOIS/IPA/PSI[a] finding	HRS[b] Score	HRS[b] Score	EPA CERCLA Process Element	DOE CEARP/CERCLA[c] Other Phase
Rad Soil Burial (300 Area)	Removed	NA[d]	NA	NA	None	Compliance and Verification (Phase V)
Rad Site (400 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Rad Sites (2) (500 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Rad Sites (2) (600 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
Rad Sites (4) (700 Area)						
Site 1	Inactive	Positive	NE[e]	NE	None	Installation Assessment (Phase I, Supplemental)
Site 2	Inactive/ Immobilized	NA	NA	NA	None	Compliance and Verification (Phase V)
Site 3	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Site 4	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Rad Sites (2) (800) Area						
Site 1	Inactive/ Covered	Positive	29	0	None	Confirmation (Phase II)

Table V 2. Potential CERCLA Sites Identified During CEARP Phase I with Possible Radioactive Waste or Contamination (con)

Site	Status	DOE CEARP Phase I: FFSDIF/PA/PSI[a] findins	DOE CEARP Phase I: HRS[b] Score	DOE CEARP Phase I: MMRS[b] Score	Planned Future Action: EPA CERCLA Program Element	Planned Future Action: DOE CEARP/CERCLA[c] Order Phase
Site 2	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)
903 Lip Area (900 Area)	Inactive/ Partially Removed	NA	NA	NA	None	Remedial Action (Phase IV)
Triangle Area (900 Area)	Inactive/ Cleaned	NA	NA	NA	None	Compliance and Verification (Phase V)

[a] Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d] Not Applicable
[e] Not Evaluated

CERCLA Finding - Remedial action completed, verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately Based on the results of these data, appropriate action will be taken

V.A.2.c. Radioactive Sites (2), 500 Area. An area north of Building 551 was used to load boxed radioactive material into railroad cars. Some of the boxes leaked. Persons interviewed indicated that residual radioactive contamination may have remained at this site. In addition, a process waste line ruptured in 1977, flooding a waste collection tank near Building 559. The material was confined to the waste tank and the soil around the lines. The area was subsequently cleaned up (PC 1985b). Residual surface radioactivity should have been detected and removed from both sites during the radiometric survey.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken

V.A.2.d. Radioactive Sites (2), 600 Area. Records and interviews indicate that two locations within the 600 Area may contain residual low-level radioactive contamination from plutonium (the Building 444 parking lot and the area east of this parking lot and west of Building 664). The surface soil was removed from both areas in the early 1970s; however, some of those interviewed mentioned that small amounts of plutonium may have remained (Owen 1973). Residual surface radioactivity should have been detected and removed during the radiometric survey.

CERCLA Finding - Remedial action completed, verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.2.e. Radioactive Sites (4), 700 Area

Site 1. Shortly after the 1969 fire, an area north of Building 776 was radioactively contaminated (Owen 1973). This area was subsequently covered with gravel, and those interviewed mentioned that it probably was not decontaminated prior to being covered.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - The radiometric survey data will be compiled by CEARP These data will be used to evaluate the current status of this site. If warranted, a CEARP reconnaissance field study will be conducted to determine the presence or absence of residual radioactivity and the potential for migration into various environmental pathways Based on the results of these data, appropriate action will be taken.

Site 2. Some of those interviewed mentioned that during 1974, monitoring pavement on 8th Street located several radioactively contaminated spots. The corrective action taken was to pave over the street. The paving has effectively immobilized these isolated spots of radioactive contamination.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or

to recognize future problems adequately If this paving is ever removed, it will be handled as radioactive waste and shipped offsite for disposal

Site 3. An open area at the north side of Building 774 was mentioned as a location used to wash radioactively contaminated equipment. The effluent from this process flowed onto the ground. Any residual surface contamination at this location should have been detected by the radiometric survey, and any contaminated materials would have been packaged and shipped offsite for disposal.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately Based on the results of these data, appropriate action will be taken.

Site 4. Out-of-service, radioactive, laundry waste tanks exist south of Building 771 These tanks were disconnected from their respective source systems; however, they periodically fill with groundwater that has to be pumped into the new process waste system Persons interviewed suggested that these tanks may have leaked laundry waste while in use. Materials introduced into the environment from leaks in these tanks (mostly water with small amounts of detergent) would no longer be detectable except for radioisotopes.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - The tanks will be included in the onsite tank inventory (Sec. V B 6 d). The radiometric survey data will be compiled by CEARP. These data will be used to evaluate the current status of this site. If warranted, a CEARP reconnaissance field study will be conducted to determine the presence or absence of residual radioactivity and the potential for migration into various environmental pathways. Based on the results of these data, appropriate action will be taken.

V.A.2.f. Radioactive Sites (2), 800 Area

Site 1. An area east of Building 881 was used to dispose of 320 tons of plutonium-contaminated soil (about 7 dpm/g alpha activity) from the Building 776 fire (1969 time frame) and to dispose of approximately 60 yd of plutonium-contaminated soil (about 250 dpm/g alpha activity) from the Building 774 waste storage tank area. This contamination was covered with approximately 3 ft of soil and fill material (Owen 1973)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 20, MHRS Migration Mode Score 0 (Appendix B)

Planned Future Action - A CEARP Phase II reconnaissance field study will be conducted to determine the levels of residual radioactivity and the potential for migration into various environmental pathways. Based on the results of these data, appropriate action will be taken.

Site 2. In 1958, an area of several hundred square feet located northwest of Building 881 was radioactively contaminated by a concrete slab that had been removed from the side of Building 776 The slab was broken up and the area was cleaned; however, these activities may have resulted in some low-level contamination (Owen 1973) Any remaining surface contamination should have been detected and removed during the radiometric survey.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.2.g. 903 Lip Area, 900 Area. During drum removal and cleanup activities associated with the 903 drum storage area, winds redistributed plutonium beyond the pad to the east. Approximately 1 Ci of plutonium was deposited between the pad and the security fence Partial cleanup of this area, referred to as the 903 Lip Area,

occurred in 1978 when about 4 7 million lbs of contaminated soil containing 0 56 Ci plutonium was removed, packaged, and shipped offsite as radioactive waste (Barker 1982) Radioactive contamination is known to exist in the 903 Lip Area, and additional material is being removed

CERCLA Finding - Radioactivity is still being removed from this site; therefore, it is considered to be in CEARP Phase IV A CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The additional data collected during the remainder of the remedial action phase will be evaluated under CEARP to determine whether any actions are required to remedy or control environmental problems. Based on the results of these data, appropriate action will be taken.

V.A.2.h. Triangle Area, 900 Area. The triangle area, located east of the 207 solar evaporation ponds and inside the security fence, was used from 1966 to 1975 for surface storage of plutonium-contaminated waste (ash heels and Fulflo filters) and of plutonium-contaminated equipment and materials from cleanup of the 1969 fire. By 1971, all this material had been placed into about 10 cargo containers. Subsequently, leaks from the cargo containers were detected, and a program was started to box all this material (including the cargo containers) and to ship it offsite as radioactive waste for disposal Cleanup operations were completed by 1975, and the triangle area has not been used since that time to store radioactive materials (Owen 1973). The radiometric survey should have identified any areas with radioactivity above background levels, and any material found should have been cleaned up, packaged, and shipped offsite to a DOE disposal facility.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.3. Sites with Possible Radioactive/Hazardous Chemical Waste or Contamination. Table V-3 lists potential CERCLA sites at the plant that are known or suspected to have both radioactive and hazardous chemical waste or contamination These sites are discussed in the same order as they are listed in Table V-3.

V.A.3.a. Original Process Waste Lines, All Areas. A new process waste line system was installed in the late 1970s, and the old system was flushed, sealed, and left in place. The original system contains limited quantities of uranium and plutonium. When operational, the original system carried an aqueous radioactive/chemical waste (sometimes acidic and sometimes basic). Materials in the environment from leaks in this system could include radioisotopes, metallic ions, sodium, potassium, sulfates, and nitrates.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and radionuclide concentrations both in and adjacent to the line. The potential for migration into various environmental pathways will be evaluated. Based on the results of these data, appropriate action will be taken.

V.A.3.b. Original Landfill, Original Plant Site Outside the Security-Fenced Area. The original (south) onsite landfill is located south of the security-fenced area but inside the original plant site. This landfill measures approximately 124 x 400 ft and has an estimated volume of 2 million ft^3 It was used from 1952 to 1968 to dispose of general plant wastes and is known to contain about 44 lbs of depleted uranium ash (Owen 1973). Persons interviewed mentioned that this landfill may have received nonradioactive hazardous chemical waste generated at the plant, including solvents. Some of the people interviewed mentioned that an old graphite dump was located south of Building 440, and that this dump may have received beryllium and/or uranium. The site of the dump is actually this original landfill (PC 1985c).

No detailed information on the contents of this landfill is available.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; HRS Migration Mode Score 15; MHRS Migration Mode Score 5 (Appendix B).

Table V.3. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Radioactive/Hazardous Chemical Waste or Contamination

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] finding	HRS[b] Score	HWRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Original Process Waste Lines (all areas)	Inactive/ Covered	Positive	NE[d]	NE	None	Installation Assessment (Phase I, Supplemental)
Original Landfill (OPS)	Inactive/ Covered	Positive	15	5	None	Confirmation (Phase II)
Present Landfill (OPS)	Active/ Inactive	Positive	34	5	Remedial Investigation	Confirmation (Phase II)
Trench T-1 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trench T-2 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trench T-3 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
Trenches T 4 to T-11 (900 Area)	Inactive/ Covered	Positive	17	6	None	Confirmation (Phase II)
207 Solar Evaporation Ponds (900 Area)	Active	Positive	46	7	Remedial Investigation	Confirmation (Phase II)
Retention Ponds (OPS/Buffer Zone)	Active	Uncertain	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Cooling Tower Ponds (400 Area)	Inactive/ Covered	Positive	12	NE	None	Confirmation (Phase II)

Table V.3. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Radioactive/Hazardous Chemical Waste or Contamination (con)

Site	Status	DOE CEARP Phase I: FFSDIF/PA/PSI[a] Finding	DOE CEARP Phase I: HRS[b] Score	DOE CEARP Phase I: HHRS[b] Score	Planned Future Action: EPA CERCLA Program Element	Planned Future Action: DOE CEARP/CERCLA[c] Order Phase
903 Drum Storage Area (900 Area)	Inactive/ Cleaned	Positive	26	1	None	Confirmation (Phase II)
Mound Area (900 Area)	Inactive/ Cleaned	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Out-of-Service Process Waste Tanks (700 Area)	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Concrete Process Waste Tanks (700 Area)	Spill	NA[a]	NA	NA	None	Compliance and Verification (Phase V)
Radioactive Liquid Waste Storage Tanks (700 Area)	Spill	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Holding Tanks (700 Area)	Spill	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Valve Vault 7 (700 Area)	Spill	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Sewer Line Break (700 Area)	Spill	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Radioactive Liquid Leaks (8) (700 Area)	Leaks	NA	NA	NA	None	Compliance and Verification (Phase V)

Table V.3. Potential CERCLA Sites Identified During CEARP Phase I with Possible Radioactive/Hazardous Chemical Waste or Contamination (con)

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] Finding	HRS[b] Score	HWRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Process Waste Leaks (800 Area)	Leaks	NA	NA	NA	None	Compliance and Verification (Phase V)
Effluent Pipe Break (700 Area)	Leak	NA	NA	NA	None	Compliance and Verification (Phase V)
Low-Level Radioactive Waste Leak (900 Area)	Leak	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Ash Pits (OPS)	Inactive/ Covered	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Old Outfall (700 Area)	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Oil Burn Pit No. 1 (300 Area)	Inactive/ Built Over	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Oil Burn Pit No. 2 (900 Area)	Removed	NA	NA	NE	None	Compliance and Verification (Phase V)
Sludge Disposal (900 Area)	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Waste Spills (100 Area)	Spill	NA	NA	NA	None	Compliance and Verification (Phase V)

Table V.3. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Radioactive/Hazardous Chemical Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] Finding	HRS[b] Score	HHRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Sanitary Waste Line Leak (800 Area)	Leak	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Underground Concrete Tanks (400 Area)	Inactive	Positive	NE	NE	None	Installation Assessment (Phase I, Supplemental)
Pellet Burn Site (900 Area)	Removed	NA	NA	NA	None	Compliance and Verification (Phase V)

[a] Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d] Not Applicable
[e] Not Evaluated

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether further action is warranted under CEARP Phase III

V.A.3.c. Present Landfill, Original Plant Site Outside the Security Fenced Area. The present (north) onsite landfill is located 900 ft north of the security-fenced area on the north side of the plant within the original plant site. The original portion of this landfill was placed in service in 1968. In 1974, a major expansion was undertaken (Zeff 1974), including soil investigations to determine the content and extent of groundwater contamination (see the plant EIS for details (RFEIS 1980)).

An estimated 9 million lbs of waste is disposed of annually at this onsite landfill. Persons interviewed mentioned that this landfill may have received chromates, electrodischarge machining (EDM) fluid (a liquid similar to kerosene), solvents, several small strontium calibration sources, and small amounts of organic chemicals. In March 1985, personnel from a subcontractor were found dumping paint, paint thinner, and paint remover into this landfill (PC 1985b). Records show that this landfill received about 2,200 lbs of sanitary sewage sludge between 1968 and 1970 (suspect for heavy metals and radioactivity), and that leachate from this landfill contained both tritium and long-lived alpha (RFEIS 1980). Leachate from the landfill is collected in a small pond and was spray irrigated to the north and east of the landfill area from about 1968 to 1974. Since that time it has been spray irrigated to the south and west. Current monitoring data show that neither tritium nor long-lived alpha exceeds background levels in the pond (Owen 1973, RFEIS 1980, AEMR 1983 to 1985).

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 34; MHRS Migration Mode Score 5 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.d. Trench T-1, 900 Area. Trench T-1, a burial trench, is located just north of Central Avenue and immediately west of the East Guard Gate. It was used from 1952 until 1962 and contains 125 drums filled with depleted uranium chips coated with small amounts of lathe coolant (a mixture of about 70% hydraulic oil and 30% carbon tetrachloride). This trench was covered with about 2 ft of soil, and the corners of the trench were marked (Owen 1973). However, two drums were uncovered when

weeds were being cut in 1982, and one drum contained an oily sludge with 4 3 picocuries per gram of plutonium and 1 2 microcuries per gram of uranium (PC 1985c).

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 17, MHRS Migration Mode Score 6 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.e. Trench T-2, 900 Area. Trench T-2 is located south of the 903 drum storage area and west of the reactive metal destruction site within the 900 Area This trench measures about 50 x 300 ft and was used prior to 1968 for the disposal of sanitary sewage sludge, and flattened drums contaminated with uranium and plutonium (Owen 1973)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 17; MHRS Migration Mode Score 6 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.f. Trench T-3, Original Plant Site Outside the Security-Fenced Area. Trench T-3 is located just east of the East Access Gate (Gate 9) outside the security fence This trench measures about 50 x 300 ft and was used prior to 1968 for the disposal of flattened drums contaminated with uranium and plutonium. This trench also received substantial quantities of sanitary sewage sludge (Owen 1973).

CERCLA Finding - Positive for FFSDIF, PA, and PSI; HRS Migration Mode Score 17, MHRS Migration Mode Score 6 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.g. Trenches T-4 to T-11, Original Plant Site Outside the Security-Fenced Area. Trenches T-4 through T-11 are all located just east of the East Access Gate (Gate 9) outside the security fence. These trenches, approximately 50 x 300 ft, were used from 1954 to 1968 for the disposal of flattened drums contaminated with uranium and plutonium. Activity ranges from 800 to 8,000 dpm/g. Trenches T-4 and T-

11 also contain some uranium/plutonium-contaminated asphalt planking from the solar evaporation ponds and quantities of sanitary sewage sludge (Owen 1973)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 17, MHRS Migration Mode Score 6 (Appendix B)

Planned Future Action - The trenches will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.h. 207 Solar Evaporation Ponds, 900 Area. The 207 solar evaporation ponds, located in the northern part of the 900 Area, were constructed over an extended period, beginning in the mid-1950s to hold effluents from treated process wastes that were high in nitrates. Originally, the solar evaporation ponds were a couple of clay-lined ponds near Building 779 to hold effluent (mostly water) that remained after processing liquid wastes in Building 774. The effluent from treating acid wastes was thick with aluminum hydroxide and difficult to filter; therefore, this effluent was solidified with cement and shipped offsite for disposal or held in the ponds. Pond A was constructed and lined with planking and asphalt to hold this effluent (high in nitrates) prior to its being processed and shipped. The bottom of pond A buckled and the pond leaked. Therefore, the three B ponds (B-North, B-Center, and B-South) were constructed during 1960 and lined with asphalt cement over the planking. On hot days, the asphalt cement would slide, crack, and leak. An attempt was made to mend these leaks using Mastick (trademark), burlap, asphalt, and Phillips Petromat (trademark) However, cracks developed under the northeast corner of pond B-North After an especially wet winter and spring, the A pond and the three B ponds were full, therefore, pond C was constructed in 1970 Pond C was constructed over the original clay-lined ponds.

Over time, these ponds received sanitary sewage sludge, radioactive liquid wastes from the beagle dog studies done at Colorado State University, lithium metal, and various liquids. As recently as December 1983, pond A received chemicals including sodium nitrate, ferric chloride, lithium chloride, sulfuric acid, and ammonium persulfate (PC 1985b). However, oils and solvents have been kept out of the ponds to prevent surface scum that would hamper evaporation.

Leachate (high in nitrates and other contaminants) from the leaking solar ponds contaminated shallow groundwater. To prevent this contaminated groundwater from dis-

charging into the North Walnut Creek drainage, a groundwater interceptor system was installed in 1970. Water collected by this system is returned to the ponds. As part of the NPDES permit process in 1982, a set of samples from the hillside interceptor system was collected and analyzed for the priority pollutants and other specified metals. Cadmium, lead, nickel, selenium, thallium, chloroform, and trichloroethylene were detected. The system is now routinely monitored for these seven pollutants.

During the 1980s, sludge was removed from the B ponds. Cleanup of pond A started in 1985. Because pond C has not been known to leak during normal operation, it has been retained in semi-active status for use on a demand basis (Owen 1973, PC 1985b).

Steep hillsides surrounding the plant are known to slump when saturated with water. Because these ponds are located adjacent to the North Walnut Creek drainage, slumping could occur, causing damage to the ponds and releasing liquid. A high priority item is to eliminate the ponds.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 46; MHRS Migration Mode Score 7 (Appendix B).

Planned Future Action - Rocky Flats Plant is currently removing sludge from the bottom of pond A. A site characterization study will be performed under CEARP Phase II. All cleanup activities, monitoring data, and reconnaissance data will be reviewed under CEARP to determine what future actions may be warranted.

V.A.3.i. Retention Ponds (A,B,C Series), Original Plant Site Outside the Security-Fenced Area and the Buffer Zone. There are three series of retention ponds (A, B, and C) on North Walnut Creek, South Walnut Creek, and Woman Creek (respectively). These ponds are located outside the security-fenced area, and, except for the final pond on each series, are within the original plant boundary. The retention ponds are used primarily to capture and control surface water runoff to allow sampling and analysis to be done prior to reuse or release of the water downstream. Prior to 1979, some of the ponds were used to hold various wastes that contained nitrates and low levels of radioactivity. Water from the ponds was periodically discharged under NPDES permit- and DOE- (or its predecessor) radioactivity limits in effect at that time. Extensive efforts have been made to reduce the amount of water discharged from the plant site. For example, in 1983, water was discharged on four days only and that was dependent upon

precipitation (AEMR 1984, RFEIS 1980) Data are needed to determine whether hazardous substances occur in the pond sediments

CERCLA Finding - Uncertain for FFSDIF, PA, and PSI, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.j. Cooling Tower Ponds (3), 400 Area. There were three cooling tower blowdown ponds (containing chromates and algicides) located near Building 444 One pond measured about 30 x 100 ft; the other two measured about 25 x 75 ft. These ponds were also used on occasion to destroy lithium metal (Owen 1973). The ponds were covered with fill and may have been used to bury small amounts of depleted uranium (Owen 1973). The amount of hazardous substances that remain in the environment at this site is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; HRS Migration Mode Score 12, MHRS Migration Mode Score not evaluated because of insufficient information

Planned Future Action - The radiometric survey data will be compiled by CEARP These data will be used to evaluate the current status of these sites. If warranted, a CEARP reconnaissance field study will be conducted to determine the presence or absence of residual radioactivity and the potential for migration into various environmental pathways Based on the results of these data, appropriate action will be taken.

V.A.3.k. 903 Drum Storage Area, 900 Area. The 903 drum storage area, located south of Central Avenue, contained about 5,240 drums of spent machine cutting oil (lathe coolant, a mixture of about 70% hydraulic oil and 30% carbon tetrachloride). Approximately 3,570 of these drums contained plutonium. Between 1967 and 1968, all the drums were removed, the liquid was solidified, everything was repackaged, and all material was shipped offsite to a DOE disposal facility. After the drums were removed, efforts were undertaken to scrape and move the plutonium contaminated soil into a relatively small area, cover it with fill material, and top it with an asphalt containment cover This work was completed in November 1969. Some measurements in 1970 indicated that

an estimated 11 4 Ci of plutonium leaked into the soil before the drums were removed, most of which (about 8 6 Ci) remained onsite (RFEIS 1980) It is also estimated that about 1 7 Ci of plutonium was under the asphalt pad (Owen 1973, Krey 1975) The remaining plutonium was carried offsite (Sec. V A.5.a) Plutonium remains in the soil under the asphalt pad. Mineral oil and solvents may remain in the soil from leaking lathe coolant.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 26; MHRS Migration Mode Score 1 (Appendix B)

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.3.l. Mound Area, 900 Area. The mound area, located near the East Guard Gate, contained 1,405 drums filled with depleted uranium and beryllium wastes. The wastes were mostly solid, however, some drums were filled with lathe coolant (a mixture of about 70% hydraulic oil and 30% carbon tetrachloride). Cleanup of the mound area was achieved in 1970, and the materials removed were packaged and shipped offsite as radioactive waste. Subsequent soil sampling in the vicinity of the excavated mound area indicated 0.8 to 112.5 dpm/g alpha activity This radioactive contamination was thought to have come from the 903 drum storage area rather than from the mound area (Owen 1973).

A limited quantity of mineral oil and solvents, along with the alpha contamination, may remain in the soil from leaking lathe coolant.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.m. Out-of-Service Process Waste Tanks, 700 Area. Out-of-service process waste tanks exist north of Building 771. These tanks have been disconnected from their respective source systems and periodically fill with groundwater that has to be

pumped into the new process waste system Information from the inte
that these tanks may have leaked process waste while in use

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however there is not su
cient information to calculate HRS and MHRS Migration Mode Scores

Planned Future Action - The tanks will be included in the onsite tank inventory (Sec V B 6 d) A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of residual radioactivity and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.n. Concrete Process Waste Tanks, 700 Area. From the late 1950s until 1970, six concrete tanks located east of Building 774 were used to hold process wastes. The process wastes were an aqueous solution with plutonium, uranium, acids, and caustics. These tanks frequently overflowed, and one overflow in the late 1950s flowed down the road toward Walnut Creek (Owen 1973). These tanks were removed in the early 1970s. Details on the amount of decontamination were not found in the literature.

Nonradioactive materials, primarily sodium, potassium, sulfur, and nitrates, introduced into the environment from leaks in these tanks may no longer be detectable Residual surface radioactive contamination should have been removed during the radiometric survey

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Appropriate action will be taken as necessary

V.A.3.o. Radioactive Liquid Waste Storage Tanks, 700 Area. Persons interviewed mentioned that one large overflow occurred at the radioactive liquid waste storage tanks located south of Building 774 (probably the pipe break that occurred in the late 1970s). The liquid--containing plutonium, americium, and possibly uranium--flowed toward the front of the building. This overflow was immediately cleaned up.

Another spill of process waste occurred at Building 774 in July 1981 material dried, radiological measurements of the area indicated no [illegible] above background (PC 1985b) Nonradioactive materials introduced into the from these overflows or spills may no longer be detectable. Although surface [illegible] ity above background was removed during the radiometric survey, the amount of alpha contamination remaining in the subsurface soil around the tanks is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - The tanks will be included in the onsite tank inventory (Sec. V B 6 d). A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.n. Holding Tanks, 700 Area. Some of those interviewed mentioned that in the early 1980s, tank #66 (an underground cement holding tank for radioactive liquid waste) overflowed. This overflow (about 50 to 100 gal) was high in nitrates and contained plutonium and uranium. They also mentioned that the area has since been paved over; however, they were not sure how much material was cleaned up prior to paving

Although surface radioactivity above background was removed during the radiometric survey, the amount of alpha contamination remaining under the pavement is unknown. Nonradioactive materials introduced into the environment from this overflow may no longer be detectable .

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - The tanks will be included in the onsite tank inventory (Sec. V.B.6 d). A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.q. Valve Vault 7, 700 Area Persons interviewed [illegible] that sometime prior to 1973, valve vault 7 controlling the 800 Complex main line, located on Sage Avenue, overflowed The liquid flowed along the [illegible] south [illegible] Building 707. They said they believed this liquid could have contained uranium, organic oils, beryllium, nitric acid, hydrochloric acid, and fluorides. The valve vault was replaced in March of 1973 There have been other overflows, the most recent occurred in April 1983 (PC 1985a).

Most of the nonradioactive materials introduced into the environment from these overflows may no longer be detectable. Surface radioactivity above background should have been removed during the radiometric survey.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS or MHRS scores

Planned Future Action· A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.r. Sewer Line Break, 700 Area. Some of the people interviewed mentioned that the sanitary sewer line broke somewhere between Buildings 779 and 777, and that this break resulted in some low-level radioactive contamination of the hillside. The only radioactive material carried in sewer lines was the laundry effluent from about 1969 to 1973. The hillside is about 500 ft north of this location.

The materials introduced into the environment from this sewer line break (mostly water containing sanitary wastes and laundry wastes) may no longer be detectable except for radioisotopes. Surface radioactivity above background should have been removed during the radiometric survey at the plant.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS or MHRS scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for

migration into various environmental pathways Based on the results of , ap-propriate action will be taken.

V.A.3.s. Radioactive Liquid Leaks (8), 700 Area. In interviews, some people mentioned eight locations outside of buildings that received radioactive contamination from spills or leaks Most of this contamination was liquid process waste (a radioactive, liquid mixed waste containing caustics or acids), and the areas were subsequently decontaminated. No environmental hazard should remain Additionally, surface radioactivity above background should have been removed during the radiometric survey.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately.

V.A.3.t. Process Waste Leaks, 800 Area. Persons interviewed mentioned that low-level radioactive contamination exists north of Building 881 from leaks in the process waste lines. In addition, in January 1978, a few gallons of process waste was spilled near the 865 guard post. This area was immediately cleaned, and a survey did not detect radioactivity above background levels (PC 1985c). No environmental hazard should remain Additionally, surface radioactivity above background should have been removed during the radiometric survey.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately.

V.A.3.u. Effluent Pipe, 700 Area Persons tioned that prior to beginning evaporation operations in Building 374, the effluent pipe from Building 774 to the 207 solar evaporation ponds separated and leaked These evaporation operations started in 1980 and now evaporate the effluent from Building 774 Since the start of operations in Building 374, this pipe has not been used Materials introduced into the environment from this leaking pipe damaged the vegetation in localized areas. This area was cleaned up and no current visual evidence of this leak exists. The pipe carried a radioactive aqueous solution with caustics or acids. The natural buffering action of the soil would have neutralized these caustics or acids, and no environmental hazard should remain. Additionally, surface radioactivity above background should have been removed during the radiometric survey

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately

V.A.3.v. Low-Level Radioactive Waste Leak, 900 Area Some people interviewed mentioned that, during some construction activities, the low-level waste discharge line between Building 995 and Building 774 had been severed several times Materials introduced into the environment from these leaks may be masked by the releases from the 207 solar evaporation ponds. The low-level waste line carried an aqueous waste high in nitrates with small amounts of plutonium.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - The additional studies planned for the 207 solar evaporation ponds (Sec. V A.3 h) will encompass potential contamination from these releases. A CEARP Phase I reconnaissance field study will be conducted to determine the presence or

absence of hazardous substances and the potential for migration into var environmental pathways Based on the results of this study, appropriate action will be aken

V.A.3.w. Ash Pits, Original Plant Site Outside the Security-Fenced Area. Prior to the early 1960s, an incinerator was located along the west access road near the plant's original west boundary. This was a small incinerator (firebox with a 10 to 20 ft stack) used to burn office-type wastes. People also mentioned in interviews that depleted uranium chips were burned in this incinerator. The ashes were either put into pits (located adjacent to the incinerator) or were pushed over the side of the hill next to the incinerator into the Woman Creek drainage. Incineration was discontinued and the incinerator was demolished in the early 1960s. The ash pits were covered with fill. The types and amounts of hazardous substances that may remain at this site are unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.x. Old Outfall, 700 Area. Persons interviewed mentioned that some process or laundry waste lines from Building 771 drained into the Walnut Creek outfall for the first couple of years of building operations. The exact time is unknown, however, it would have been in the mid-1950s.

The materials introduced into the environment from these waste lines (sodium, potassium, sulfates and nitrates) would no longer be detectable, with the possible exception of radioisotopes. However, because the process waste was not well characterized in early operations, additional data are needed to determine if other residual nonradioactive hazardous substances remain in the environment at this location. Radiological monitoring of selected locations on this stream channel is performed annually, and these data do not indicate levels of radioisotopes above applicable standards (AEMR 1974 through AEMR 1985).

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study wi conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study appropriate action will be taken

V.A.3.y. Oil Burn Pit Number 1, 300 Area Building 335 is constructed over oil burn pit number 1 and a lithium metal destruction site This pit was used in 1956 to burn oil containing depleted uranium. It contained residual by-products from burning operations and was covered with soil (Owen 1973)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study, appropriate action will be taken

V.A.3.z. Oil Burn Pit Number 2, 900 Area. Oil burn pit number 2 was located close to the mound area north of the 903 drum storage area This pit was used in 1957 and from 1961-1965 to burn approximately 1,083 drums of oil containing uranium. The residues from the burning operations and some flattened drums were covered with backfill The pit was subsequently cleaned up and removed during the 1970s. Cleanup operations required the excavation of a hole approximately 5 ft deep (Owen 1973).

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately.

V.A.3.aa. Sludge Dispersal, 900 Area The sludge from the sewage treatment plant is collected in drying beds and, once dried, is packaged and shipped offsite for disposal as radioactive waste The only radioactive material that entered the sewage treatment plant was radioactive laundry effluent from about 1969 to 1973 Prior to 1983, some of the dried sludge became airborne and was dispersed around the drying beds and on both sides of the perimeter road east of Building 995 during packaging operations Those operations are now conducted in an enclosure Concentrations of residual hazardous substances introduced to the environment from this windblown sludge are unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study, appropriate action will be taken.

V.A.3.bb. Waste Spills, 100 Area. Persons interviewed mentioned that several small spills of nitrate wastes occurred around the outside of Building 123 These wastes may have contained radionuclides. The nitrates introduced into the environment from these small spills would probably not be detectable The radiometric survey should have identified any areas with radioactivity above background levels, and any material found should have been cleaned up, packaged, and shipped offsite to a DOE disposal facility

CERCLA Finding - Remedial action completed, verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be completed by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.3.cc. Sanitary Waste Line Leak, 800 Area In January 19 he sanitary waste line located south of Building 881 leaked The waste line was r- ed, and an earthen dike was placed to prevent seepage into the south interceptor ditch (PC 1985b) The only radioactive material that entered the sanitary sewer system was radioactive laundry effluent from about 1969 to 1973 Whether hazardous substances exist at this site is unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study, appropriate action will be taken

V.A.3.dd. Underground Concrete Tanks, 400 Area. There are several underground concrete tanks located south of Building 441 that contained nitrates and possibly radionuclides. Persons interviewed mentioned that these tanks may have leaked. They were part of the original process waste system and have not been removed

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate HRS and MHRS Migration Mode Scores

Planned Future Action - These tanks will be included in the onsite tank inventory (Sec V B 6 d) A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.3.ee. Pallet Burn Site, 900 Area. Some of those interviewed said that in 1965, an area southwest of oil burn pit number 2 was used to destroy wooden pallets. The types of hazardous substances or radionuclides that may have been spilled on these pallets is unknown. This site was removed in the 1970s.

CERCLA Finding - Remedial action completed; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS and MHRS Migration Mode scoring.

Planned Future Action - The radiometric survey data will be compiled by CEARP and used to verify and to document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately. Based on the results of these data, appropriate action will be taken.

V.A.4. Sites with Possible Nonradioactive Hazardous Chemical Waste or Contamination. Table V-4 lists potential CERCLA sites at the plant known or suspected to have nonradioactive hazardous waste or contamination. Because none of these sites contain radioisotopes, MHRS Migration Mode scoring is not applicable. These sites are discussed in the same order as they are listed in Table V-4.

V.A.4.a. Cooling Tower Blowdown, 300 Area. Persons interviewed mentioned that the area immediately south of Building 374 received some cooling tower blowdown (containing chromates and algicides). The amount of these materials that may remain in the environment at this site is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.b. Cooling Tower Blowdown, 700 Area. Persons interviewed mentioned that there was some cooling tower blowdown south of Building 774 that drained northward into North Walnut Creek. This water contained chromates and algicides. They probably referred to the cooling tower spill of about 400 gal that leaked into a storm drain near Building 779 in December 1976. Analysis of this spill indicated about 50 ppm total chromium in the water spilled (PC 1985b).

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential

Table V 4. Potential CERCLA Sites Identified During CEARP Phase I with Possible Nonradioactive Hazardous Chemical Waste or Contamination

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/PSI[a] Finding	NRS[b] Score	HRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Cooling Tower Bleudown (300 Area)	Inactive	Positive	NE[d]	NA[e]	None	Installation Assessment (Phase I, Supplemental)
Cooling Tower Bleudown (700 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Hillside Oil Leak (800 Area)	Leak	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Oil Leak (400 Area)	Leak	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Oil Sludge Pit (800 Area)	Inactive/ Covered	Positive	9	NA	None	Confirmation (Phase II)
Fuel Oil Leak (300 Area)	Leak	NA	NA	NA	None	Compliance and Verification (Phase V)
Fuel Oil Tank (600 Area)	Spill	NA	NA	NA	None	Compliance and Verification (Phase V)
Lithium Metal Destruction Site (300 Area)	Inactive/ Built Over	Positive	8	NA	None	Confirmation (Phase II)
Reactive Metal Destruction Site (900 Area)	Inactive/ Covered	Positive	16	NA	None	Confirmation (Phase II)
Chemical Storage (500 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)

Table V.4. Potential CERCLA Sites Identified During CEARP Phase I with Possible Nonradioactive Hazardous Chemical Waste or Contamination (con)

Site	Status	DOE CEARP Phase I			Planned future Actiuh	
		FFSDIf/PA/PSI[a] Finding	HRS[b] Score	HWRS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
Fiberglassing Sites (2) (600 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Liquid Dumping (800 Area).	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Chemical Burial (800 Area) '	Inactive/ Covered	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Outfall (600 Area)	Inactive	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Out of Service Fuel Tanks (800 Area)	Inactive/ Filled	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Acid Leaks (2) (400 Area)	Leak	Negative	NA	NA	None	None
Acid Leak (300 Area).	Leak	Negative	NA	NA	None	None
Multiple Acid Spills (800 Area).	Spill	Negative	NA	NA	None	None
Caustic/ Acid Spills (700 Area)	Spill	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Caustic Leak (400 Area)	Leak	Negative	NA	NA	None	None

Table V 4. Potential CERCLA Sites Identified During CEARP Phase I with Possible Nonradioactive Hazardous Chemical Waste or Contamination (con)

Site	Status	DOE CEARP Phase I: FFSDIF/PA/PSI[a] Finding	DOE CEARP Phase I: HRS[b] Score	DOE CEARP Phase I: MHRS[b] Score	Planned Future Action: EPA CERCLA Program Element	Planned Future Action: DOE CEARP/CERCLA[c] Order Phase
Hydrogen Peroxide Spill (400 Area)	Spill	Negative	NA	NA	None	None
Multiple Solvent Spills (400 Area)	Spill	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Multiple Solvent Spills (700 Area)	Spill	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Multiple Solvent Spills (900 Area)	Spill	Positive	NE	NA	None	Installation Assessment (Phase I, Supplemental)
Antifreeze Discharge (OPS)	Discharge	Negative	NA	NA	None	None
Steam Condensate Leak (400 Area)	Leak	Negative	NA	NA	None	None
Steam Condensate Leak (700 Area)	Leak	Negative	NA	NA	None	None
Nickel Carbonyl Disposal (OPS)	Inactive/ Covered	Negative	NA	NA	None	None
Water Treatment Plant Backwash Pond (100 Area)	Inactive	Negative	NA	NA	None	None
Scrap Metal Sites (2) (500 Area)	Removed	Negative	NE	NA	None	None

Table V.4. Potential CERCLA Sites Identified During CEARP Phase I
with Possible Nonradioactive Hazardous Chemical Waste or Contamination (con.)

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFSDIF/PA/SI[a] finding	HRS[b] Score	NRMS[b] Score	EPA CERCLA Program Element	DOE CEARP/CERCLA[c] Order Phase
VOCs in Groundwater	Leak	Positive	48	NA	Remedial Investigation	Confirmation (Phase II)

[a] Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b] EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c] Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d] Not Evaluated
[e] Not Applicable

for migration into various environmental pathways Based on the results of this study, appropriate action will be taken

V.A.4.c. Hillside Oil Leak, 800 Area In 1973, there was an oil leak, believed to be from the fuel oil storage tanks (Sec V A 4 o) on the hillside south of Building 881 Straw was used to limit the spread of the oil, and the oil-soaked straw and soil were removed and placed in the present onsite landfill (Owen 1973) The concentration of fuel oil residuals remaining in the environment at this site is unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study, appropriate action will be taken

V.A.4.d. Oil Leak, 400 Area In November 1977, an underground oil leak was discovered near Building 443 (the steam plant) The leak was from a transfer pipe that was excavated and repaired Oil has been periodically spilled in this area, and in July 1983, high groundwater forced oil out of the soil near this building (PC 1985b) The concentration of oil residuals remaining in the environment at this site is unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.e. Oil Sludge Pit, 800 Area. In 1958, approximately 30 to 50 drums of oil sludge from cleaning storage tanks (Sec. V A 4 o) were emptied into a pit south of Building 881 The pit was covered with fill (Owen 1973). The concentration of fuel oil residuals remaining in the environment at this site is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 9 (Appendix B)

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III

V.A.4.f. Fuel Oil Leak, 300 Area In August 1981, approximately 200 gal of fuel oil (#2 diesel) was spilled north of Building 374 The area was subsequently cleaned (PC 1985a)

CERCLA Finding - Remedial action completed, verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS Migration Mode scoring

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately

V.A.4.g. Fuel Oil Tank, 600 Area. One of the fuel oil tanks (facility 221) located south of Central Avenue and west of 7th Street overflowed in January 1971 while being filled This overflow (approximately 700 gal) was contained within the diked area, cleaned up, and the oil recycled (PC 1985b) A similar spill of approximately 400 gal occurred in February 1979

CERCLA Finding - Remedial action completed, verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS Migration Mode scoring.

Planned Future Action - Reconnaissance data will be collected as part of CEARP Phase V to verify and document the adequacy of the remedial action. In addition, steps will be taken to identify and plan for any continuing monitoring requirements needed to demonstrate control of any potential migration or to recognize future problems adequately.

V.A.4.h. Lithium Metal Destruction Site, 300 Area Building 335 is constructed over an old lithium metal destruction site Lithium metal was disposed of at this location by placing it in trenches and reacting it with water, the residues were covered with soil In addition, the 335 Area (and later the building) was used by the fire department for training (Owen 1973)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 8 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.4.i. Reactive Metal Destruction Site, 900 Area. The 952 area, the reactive metals destruction site, is located south of the 903 drum storage area. This site was used during the 1950s and 1960s primarily for the disposal of lithium metal (400 to 500 lbs of lithium carbonate) buried in trenches. In addition, liquids (type unknown) were occasionally burned at this location (Owen 1973) The types and quantities of hazardous materials remaining at this site are unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI, HRS Migration Mode Score 16 (Appendix B).

Planned Future Action - This site will be evaluated under CEARP Phase II to determine whether future action is warranted under CEARP Phase III.

V.A.4.j. Chemical Storage, 500 Area. Prior to the mid-1970s, a nonradioactive chemical storage area existed east of Building 551. This area was used to store drum quantities of acids, oils, soaps, and solvents. Records indicate that leaks may have occurred in this area (Owen 1973). The quantity of solvent that remains in the soil at this site is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential

for migration into various environmental pathways Based on the results of this study, appropriate action will be taken.

V.A.4.k. Fiberglassing Areas (2), 600 Area. During the 1970s, locations both north and west of Building 664 were used for fiberglassing waste packing boxes Persons interviewed mentioned that these locations may contain spilled polyester resin, peroxide catalyst materials, and cleaning solvents. The chemical concentrations remaining in the soil at these sites are unknown

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.l. Liquid Dumping, 800 Area. Persons interviewed mentioned that prior to 1969, the area east of Building 881 was used for dumping liquid and for disposing of empty drums (type of liquid or residual material in the drums was unknown). The ground surface was covered with scrap metal and disturbed, indicating burial of some type. The concentration of hazardous material that may be present in the soil at this site is unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.m. Chemical Burial, 800 Area. Some persons interviewed mentioned that the area south of Building 881 was used to bury unknown chemicals. Concentrations of hazardous materials that remain in the soil at this site are unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways Based on the results of this study, appropriate action will be taken

V.A.4.n. Outfall, 800 Area. Persons interviewed mentioned that an outfall existed south of Building 881 This outfall probably was the pipe on the hillside south of Building 881 that discharged water in December 1977 Water samples determined that this pipe is a cleanout pipe for an overflow line from a cooling tower (PC 1985c).

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.o. Out-of-Service Fuel Tanks, 800 Area. Persons interviewed stated that asbestos was placed in two out-of-service #6 fuel oil tanks located south of Building 881 and that the tanks were then filled with concrete (PC 1985a)

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - The tanks will be included in the onsite tank inventory (Sec. V B 6.d). A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.p. Acid Leaks (2), 400 Area. In September 1970, approximately 1,500 gal of sulfuric acid was spilled inside Building 443 and drained eastward from the

building This acid was captured in an earthen trap dug in an open field and neutralized with lime (Owen 1973, PC 1985c) The trap is now covered by buildings

Persons interviewed mentioned that another acid leak occurred north of Building 444 Several hundred gallons of acid leaked from a tank and flowed along Central Avenue in the drainage ditch. Details on cleanup operations are not known

These acids would have been neutralized by the buffering action of the soil, and the resulting by-products would have been benign and highly mobile in the environment No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.q. Acid Leak, 300 Area. Persons interviewed mentioned that a drum containing a mixture of nitric acid and hydrochloric acid leaked near the east gate of Building 374 in 1983. This acid would have been quickly neutralized by the buffering action of the soil, and the resulting by-products would have been benign and highly mobile in the environment. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.r. Multiple Acid Spills, 800 Area. Persons interviewed mentioned that there had been acid spills both north and west of Building 881. Spilled material was washed down with water to dilute the acid and disperse it on the ground.

The dilute acids would have been quickly neutralized by the buffering action of the soil, and the resulting by-products would have been benign and highly mobile in the environment. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted

V.A.4.s. Caustic/Acid Spills, 700 Area From the start of operation to the present, numerous small leaks and spills of caustic and acid have occurred in the area around Building 771 while tanks were being filled and and material was being transferred Potassium hydroxide and sodium hydroxide supply tanks are located south of Building 771, and hydrofluoric acid (HF) is handled at the HF storage area (Owen 1973)

During the interviews, people mentioned that there had been small leaks and spills at the caustics receiving areas north and south of Building 774. These spills were washed down with water, diluting the spilled material and carrying the diluted chemical away from the building.

The caustics and/or acids would have been quickly neutralized by the buffering action of the soil, and the resulting by-products (sodium, potassium, sulfates, and nitrates) would have been benign and highly mobile in the environment. However, the fluoride concentrations remaining in the environment are unknown.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score.

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.t. Caustic Leak, 400 Area. In 1978, approximately 1,000 gal of concentrated sodium hydroxide was accidentally released from the steam plant catch basin to the Central Avenue ditch. This liquid was diverted to retention pond B-1 on South Walnut Creek for temporary containment and neutralization. Several actions were taken that prevented the material from leaving the plant. After alum was added to neutralize the contents of retention pond B-1, the liquid in retention pond B-1 was transferred to the 207 solar evaporation pond B-North (PC 1985b). Any sodium hydroxide remaining in the environment would have been neutralized by the buffering action of the soil. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated

Planned Future Action - No further action is warranted

V.A.4.u. Hydrogen Peroxide Spill, 400 Area. In April 1981, a 55-gal drum of hydrogen peroxide was dropped at the corner of 5th Street and Central Avenue. The drum ruptured, and the liquid was contained in a hole dug at this location. The hole was subsequently covered (PC 1985b). This spill would have been neutralized by the buffering action of the soil. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.v. Multiple Solvent Spills, 400 Area. Persons interviewed mentioned that prior to 1979 both the southwest and west side of Building 444 were used for nonradioactive solvent storage. Because of minor leaks and spills, these locations may contain low levels of hydrocarbons. It is not known if solvents remain in the soil at this site.

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.w. Multiple Solvent Spills, 700 Area. Carbon tetrachloride tanks are located within diked areas north and south of Building 776 and north of the Building 776 compressor house. These tanks overflowed during the 1970s, and small leaks and spills occurred during tank filling operations. In addition, one of these tanks ruptured in June 1981. The solvent drained into a sump, which pumped some of the liquid onto the ground surface (PC 1985b).

Persons interviewed mentioned that 100 to 200 gal of trichloroethylene was spilled (prior to 1970) at the north side of Building 776 They did not recall any mitigation measures This spill may have been carbon tetrachloride (PC 1985a) It is not known whether solvents remain in the environment at these sites

CERCLA Finding - Positive for FFSDIF, PA, and PSI, however, there is not sufficient information to calculate a HRS Migration Mode Score

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken.

V.A.4.x. Multiple Solvent Spills, 900 Area. Locations along the perimeter road south of the old East Guard Gate (Gate 9) were used as solvent storage areas. Persons interviewed mentioned that there may have been minor leaks or spills. This road also had used motor oil put on it for dust control. It is not known if solvents or oil residuals remain in the soil at this site.

CERCLA Finding - Positive for FFSDIF, PA, and PSI; however, there is not sufficient information to calculate a HRS Migration Mode Score

Planned Future Action - A CEARP Phase I reconnaissance field study will be conducted to determine the presence or absence of hazardous substances and the potential for migration into various environmental pathways. Based on the results of this study, appropriate action will be taken

V.A.4.y. Antifreeze Discharge, Original Plant Site Outside the Security- Fenced Area. In December 1980, approximately 155 gal of 25% ethylene glycol (antifreeze) was released from a chiller unit into a floor drain in Building 708. The flow was contained by diverting the storm water system discharge into retention pond B-1 (PC 1985c) The ethylene glycol introduced into the environment from this spill would no longer be detectable. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - The retention ponds will be examined under CEARP Phase II (Sec V A 3 1) No further action is warranted.

V.A.4.z. Steam Condensate Leak, 400 Area In November 1979, a steam condensate line between Building 443 and a valve pit north of the gasoline storage tank leaked. Water analyses indicated a low concentration (0 135 ppm) of amines. This line was taken out of service and the condensate was rerouted through a different system (PC 1985b) The amines introduced into the environment from this leak would no longer be detectable. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.aa. Steam Condensate Leak, 700 Area. In September 1979, a steam condensate line broke near Building 707 and water from this line flowed through pond B-4 into Walnut Creek. This leak did not present any environmental hazard.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.bb. Nickel Carbonyl Disposal, Original Plant Site Outside the Security-Fenced Area. Persons interviewed mentioned that several bottles of nickel carbonyl were destroyed in a hole drilled onsite south of Lindsay Ranch. The valves were cracked open and the cylinders were lowered into the hole by ropes. After 24 hrs the cylinders were removed, vented by small arms fire, and buried in the present onsite landfill Two cylinders got stuck in the hole and were buried in place. Nickel carbonyl is highly volatile, and venting these cylinders in this hole would not result in an environmental hazard. No environmental hazard should remain.

CERCLA Finding - Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.cc. Water Treatment Plant Backwash Pond, 100 Area Persons interviewed mentioned that during the early 1970s, backwash from the raw water treatment plant (Building 124) was collected in a pond on the south side of the building This water would have contained flocculates (aluminum sulfate and lime), residual chlorine, and suspended solids They said the pond dried up and was destroyed in the late 1970s when the new canal system that reroutes surface water around the plant site was constructed The materials introduced into the environment from this pond would not pose an environmental hazard.

CERCLA Finding - Negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated

Planned Future Action - No further action is warranted

V.A.4.dd. Scrap Metal Sites, 500 Area. People said during the interviews that two scrap metal disposal sites (nonradioactive, nonhazardous, nonprecious metals) southwest of Building 559 were removed in the early 1980s when the personnel security zone (PSZ) was constructed. They also said that one of these sites may have received some old transformers that contained PCBs. However, no transformers were found during the excavation (PC 1985c). No environmental hazard should remain.

The residue from these sites was monitored for radioactivity, found clean, and disposed of in the present onsite landfill.

CERCLA Finding - Negative for FFSDIF, PA, and PSI, therefore, a HRS Migration Mode Score is not calculated.

Planned Future Action - No further action is warranted.

V.A.4.ee. VOCs in Groundwater. Rocky Flats Plant conducted a preliminary screening of the plant's drinking water, surface water, and groundwater in March and April 1985, for volatile organic compounds (VOCs). Results of these analyses indicated that no VOCs were present in the drinking or surface water at the plant. However, these preliminary data do indicate the presence of VOCs in the groundwater: trichloroethylene 6,400 ppb; tetrachloroethylene 16,000 ppb; 1,1-dichloroethylene 1,300 ppb, and 1,1,1-trichloroethane 4,800 ppb (Setlock 1985b).

NOTICE:

INCOMPLETE DOCUMENT

The following document is missing page V-48. This document was distributed in an incomplete state, and the microform copy is representative of the paper copy. If replacement pages are distributed, they will be microfilmed and included in the Administrative Record file.

The Adminstrative Record Staff

Table V.5. Potential CERCLA Sites Identified During CEARP Phase I
at Offsite Locations

Site	Status	DOE CEARP Phase I			Planned Future Action	
		FFDIF/PA/PSI[a] finding	HRS[b] Score	HRS[b] Score	EPA CERCLA Process Element	DOE CEARP/CERCLA[c] Order Phase
Land Surface Contamination	Inactive	NA[d]	NA	NA	None	Compliance and Verification (Phase V)
Great Western Reservoir	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Standley Lake	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)
Mower Reservoir	Inactive	NA	NA	NA	None	Compliance and Verification (Phase V)

[a]Federal Facility Site Discovery and Identification Findings/Preliminary Assessments/Preliminary Site Inspections
[b]EPA Hazard Ranking System/DOE Modified Hazard Ranking System
[c]Comprehensive Environmental Assessment and Response Program/Comprehensive Environmental Response, Compensation, and Liability Act
[d]Not Applicable

The State of Colorado requires special construction techniques on land containing plutonium at concentrations greater than 2 dpm/g This limit is far below the proposed EPA screening level derived from proposed dose limits Based on this state-imposed limit, recent data indicate that some land directly east of the plant may require these special measures prior to construction activities. Samples taken using the state's criteria showed a median of 2 0 dpm/g for one parcel of land and 7 0 dpm/g for another; however, using another method of sampling (to a depth of 5 cm instead of 1 cm) these same samples yielded medians of 0 7 and 1 4 dpm/g respectively (RFEIS 1980)

CERCLA Finding - Measured radioactivity below EPA screening levels; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS or MHRS scoring.

Planned Future Action - Based on current data, existing conditions do not pose an environmental risk (EPA 1976) Monitoring will be continued to detect any changes in existing conditions. Based on these data, appropriate actions will be taken.

V.A.5.b. Great Western Reservoir. Small amounts of plutonium-239 have accumulated in the sediments of the Great Western Reservoir, which lies approximately 1 5 mi east of the eastern edge of the plant boundary Part of the influent into this body of water is from the north and south forks of Walnut Creek, both of which flow east from the plant site. Great Western Reservoir (3,250 acre ft) is used as part of the municipal water supply for the city of Broomfield and has the capacity to support about 14,500 persons.

Numerous studies of plutonium and americium concentrations in the Great Western Reservoir have been made, including two by the EPA and others (EPA 1973, EPA 1975; Krey 1975, Thomas 1981, Setlock 1983). These studies have shown that detectable levels of plutonium exist at depth in the sedimentary column, but that the levels of radioactivity present (higher than fallout levels) do not constitute an environmental hazard. The plutonium in this sedimentary column is firmly attached to particulates, does not exhibit post-depositional migration, and is very insoluble in water.

The total plutonium and americium inventories (based on a single core sample) in the Great Western Reservoir are estimated at 244 mCi plutonium and 73 mCi americium,

with most of this activity located in the deep sediment deposits at the eastern end of the reservoir (Thomas 1981).

Rockwell International has collected an extensive data base on the Great Western Reservoir to address plutonium concentrations in reservoir sediment as related to plant operations (Setlock 1985a) Analyses of more than 60 sampling locations within the reservoir have shown that sedimentation rates within the reservoir are not uniform, but rather, sediments accumulate at a higher rate in the eastern (deeper) portion of the reservoir In addition, these data validate the studies performed in the 1970s showing fallout levels of plutonium in sediments from above-ground weapon tests conducted elsewhere in the 1950s and 1960s Sediment core profiles show plutonium concentrations peak at depth (former deposition), and indicate that no post-depositional migration is occurring in the sedimentary column (the plutonium is fixed to particulates at depth). Data from this study will be used to update inventories of radioisotopes in the Great Western Reservoir.

The naturally occurring radium-226 in surface and domestic waters near the plant represents a much greater relative contribution to public radiation exposure than do traces of plutonium. The measured activity of radium-226 has been 100 to 1,000 times greater than that of plutonium (Thomas 1981) Therefore, no additional studies will be performed on the Great Western Reservoir under CEARP

CERCLA Finding - Measured radioactivity below EPA screening levels; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS or MHRS scoring

Planned Future Action - Based on current data, existing conditions do not pose an environmental risk (EPA 1976). Monitoring will be continued to detect any changes in existing conditions. Based on these data, appropriate actions will be taken.

V.A.5.c. Standley Lake. Standley Lake is a large body of water (43,000 acre ft) located southeast of the plant, approximately 2 mi from the closest plant boundary. Woman Creek is a tributary of Standley Lake. The majority of water flowing into Standley Lake is from Clear Creek via an irrigation ditch. This reservoir is used as a part of the municipal water supplies for the communities of Westminster, Northglenn, and Thornton.

Numerous radiological studies have been made of Standley Lake (EPA 1973, EPA 1975, Thomas 1981, and Setlock 1985c) Plutonium and americium are found in the sediments of the lake at levels at or slightly above worldwide fallout However, these levels are below levels that would pose a health hazard to area residents (Thomas 1981) The total inventories of plutonium and americium (based on a single core sample) in Standley Lake are estimated at 61 mCi plutonium and 18 mCi americium.

As previously mentioned, the naturally occurring radium-226 in surface and domestic waters near the plant represents a much greater relative contribution to public radiation exposure than the traces of plutonium. The measured activity of radium-226 has been 100 to 1,000 times greater than that of plutonium (Thomas 1981)

CERCLA Finding - Measured radioactivity below EPA screening levels; verification will be made under CEARP Phase V, therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS or MHRS scoring.

Planned Future Action - Based on current data, existing conditions do not pose an environmental risk (EPA 1976). Monitoring will be continued to detect any changes in existing conditions. Based on these data, appropriate actions will be taken.

V.A.5.d. Mower Reservoir. Mower Reservoir is a small body of water located southeast of the plant that receives water from Woman Creek via an irrigation ditch originating on the plant site Little documentation exists on this small reservoir Concentrations of radioisotopes on sediments in this reservoir would not be expected to exceed those found in either Great Western Reservoir or in Standley Lake. These two bodies of water have been carefully analyzed as mentioned above (Sec. V A 5 b and V A.5 c).

CERCLA Finding - Measured radioactivity below EPA screening levels; verification will be made under CEARP Phase V; therefore, a CERCLA finding for FFSDIF, PA, and PSI is not appropriate, nor is HRS or MHRS scoring.

Planned Future Action - Based on current data, existing conditions do not pose an environmental risk (EPA 1976). Monitoring will be continued to detect any changes in existing conditions. Based on these data, appropriate actions will be taken.

V.B. Overview of Activity

Rocky Flats Plant was established in 1952 on land that was previously used for cattle grazing. Operations conducted at the plant were and still are devoted to making metal components for nuclear weapons and recovering these metals from components returned to the plant. A more detailed description of the plant and its operations is found in its environmental impact statement (RFEIS 1980).

Waste management programs have existed since operations started in 1952. Nonradioactive wastes generated at the plant have been segregated for onsite disposal or resale to commercial recycle vendors (WMSP 1983). Most solid radioactive wastes and solidified liquid radioactive wastes have been shipped offsite for disposal at other DOE facilities. Prior to 1970, some liquid radioactive waste (primarily lathe coolant, a mixture of about 70% hydraulic oil and 30% carbon tetrachloride) was stored in drums, awaiting development of an approved solidification process. These wastes have since been solidified and shipped offsite (WMSP 1983). Some radioactive waste was buried in onsite trenches (Sec. V A.3.d through V A.3 g) and some radioactively contaminated soil was also buried onsite (Sec. V A.2.f).

The plant has always had an active salvage operation. Materials of value were and still are salvaged for resale following verification of no radioactive contamination (RFEIS 1980). The remaining nonradioactive trash has always been disposed of onsite.

All known landfills, surface deposits, impoundments, and other waste contamination sites, including leaks and spills, within the land area controlled by the plant can be attributed to plant activities.

The plant encompasses eight areas within the security fence, the original plant site outside the security-fenced area, and the buffer zone, as shown in Figs. II.2 and II.3.

V.B.1. Waste Generation. The types of wastes generated at the plant have been consistent throughout its history. However, major changes in waste management have been made. For example, from 1954 to 1958, drums containing radioactively contaminated liquid wastes (primarily lathe coolant) were buried in the mound area (located north across Central Avenue from the 903 drum storage area), and from 1959 to the late 1960s, similar drums were stacked in the 903 drum storage area (Fig. II.3). Removal of the drums from these areas began in 1967 and was completed in 1970 (see Sec. V A.3.k and

V A 3 1 for a more detailed discussion of these activities and planned future actions regarding these sites) From 1956 to 1965, depleted uranium-contaminated oils were burned in open pits, and from 1954 to 1968, depleted uranium, flattened depleted uranium-contaminated drums, and sanitary sewage sludge were buried onsite in trenches (located near the plant's old east access gate, Gate 9; Fig. II 3). These sites were closed and covered in place. These practices were discontinued in the 1970s, and currently, all radioactive wastes are processed and shipped offsite for disposal at other DOE facilities (WMSP 1983, HWIP 1983, Putzier 1970). Planned future actions regarding these sites are given in Sec V A.

Wastes generated at the plant can be classed as radioactive, radioactive/hazardous chemical (inherently or intentionally mixed), nonradioactive hazardous chemical (RCRA-, TSCA-, or NESHAPS- regulated), or nonradioactive nonhazardous. A radioactive/hazardous chemical waste is a waste containing both radionuclides and a nonradioactive hazardous chemical.

Specific guidelines for safely handling hazardous materials (chemical, radioactive, or both) appear in the Rocky Flat Plant's Material Hazards Manual.

V.B.2. Waste Management. Rocky Flats Plant has a comprehensive waste management program for collecting, processing, recycling, and disposing of all wastes resulting from plant operations. An overview of this waste management program is presented below.

V.B.2.a. Permits.

DOE/Rockwell International currently hold the following permits:

(1) Building 122. Incinerator Permit C-12,931 was issued by the Colorado Department of Health on Mar. 25, 1982. This permit restricts the incinerator use to burning waste paper, and limits particulate emissions to .45 lbs/h and to .22 tons/yr, based on a total process weight of 125,000 lbs/yr and an operating schedule of 5 h/d for 250 ds/yr Visible emissions are limited to 20% opacity.

(2) Building 771. Incinerator Permit C-12,932 was issued by the Colorado Department of Health on Nov. 3, 1981, and was revised in April 1985. It restricts incinerator use to burning plutonium-contaminated plastic, paper, rubber, cloth, wood, etc. at an

average feed-rate of 40 lbs/h The permit requires the incinerator to use a potassium hydroxide scrubbing chamber and high efficiency, particulate air (HEPA) filters for emission control The permit revisions allow the incinerator to be operated 24 h/d until the backlog is processed and 16 h/d thereafter

(3) Building 776. Fluid Bed Incinerator Permit C-13,022 was issued by the Colorado Department of Health on Mar 25, 1984 It covers two incinerator units, but does not allow simultaneous operation of the units The permit limits use to burning plutonium-contaminated solid and liquid wastes. Particulate emissions are limited to 28 tons/yr and to .35 lbs/h when burning solid waste, and to 04 tons/yr and 25 lbs/h when burning liquid waste The exhaust from these incinerators passes through a bank of HEPA filters

(4) National Pollutant Discharge Elimination System (NPDES) Permit CO-0001333, issued by the EPA on Dec. 26. 1984, governs the discharges from seven release points (six fixed and one mobile). The fixed release points are outfall 001, which discharges from retention pond B-3; outfall 002, which discharges from retention pond A-3, proposed outfall 004, which will discharge from the reverse osmosis plant; outfall 005, which discharges from retention pond A-4; outfall 006, which discharges from retention pond B-5; and outfall 007, which discharges from retention pond C-2 The mobile release point is outfall 003, which discharges from the reverse osmosis pilot plant, at retention ponds A-3, A-4, B-4, B-5, C-1, and C-2.

(5) The plant has an interim status permit, ID No CO 07890010526, issued by the EPA under the Resource Conservation and Recovery Act (RCRA) The state of Colorado has issued a notice of its tentative decision to terminate the interim status (Sec. IV B 2)

(6) The satellite facility, Precision Forge, was issued Ventura County Air Pollution Control District Permit No. 1203 on Oct. 25, 1982. This permit governs 23 furnaces for standard nonradioactive emissions.

(7) The satellite facility at Broomfield may need a local permit from the city of Broomfield. Rockwell International has applied for a City of Broomfield Waste Water Discharge Permit.

The Lake Arbor satellite facility has not needed any permits to date A listing of all environmental permits, orders, or notices issued by federal, state, or local regulatory

agencies will be included in future environmental monitoring reports in accord with the 1985 draft DOE Order 5484 1 as environmental program information

V.B.2.b. Waste Processing and Disposal. Current waste management practices for separation and disposal of liquid and solid wastes generated at the plant are well documented (WMSP 1983, HWIP 1983) Radioactive and radioactive/hazardous chemical wastes are disposed of offsite at other DOE facilities. Nonradioactive hazardous wastes are commercially recycled, commercially disposed of, chemically rendered nonhazardous, or handled in radioactive waste process systems. Nonradioactive, nonhazardous wastes are disposed of onsite in the sanitary landfill.

V.B.2.b.1. Radioactive and Radioactive/Hazardous Chemical Wastes

Radioactive wastes at DOE facilities are subdivided into low-level waste (LLW) and transuranic (TRU) waste, based on the quantity of plutonium. TRU waste has greater than 100 nanocuries of plutonium per gram of waste and a half-life greater than 20 years. This distinction is made because the two types of wastes are managed differently. Both of these wastes are shipped offsite from Rocky Flats Plant to other DOE facilities; however, at the receiving facilities, TRU waste is placed into retrievable storage sites and LLW is placed into disposal sites (HWIP 1983, WMSP 1983, RFEIS 1980).

Figure V.1 gives a conceptual flow-path for radioactive waste management at Rocky Flats Plant. All radioactive solid wastes and solidified radioactive liquids (such as solidified lathe coolant) are separated into TRU and LLW fractions and shipped offsite Radioactive aqueous liquid wastes are first neutralized and then precipitated Precipitation sludges are processed to produce solid waste; the liquid effluent is retreated, evaporated, or recycled by additional purification to reuse onsite. Solids from the evaporation process (most of them nitrate salts) are solidified by cementation, packaged, and shipped offsite. The distinction between the TRU and LLW fractions will not be made elsewhere in this report, rather, both will be referred to as radioactive waste.

After the silver has been recovered, spent photographic and radiographic fixing solutions are combined with the radioactive waste stream and treated as radioactive liquid waste. Radioactive liquids that are incompatible with the above process are treated separately. Lathe coolant and organic solvents are solidified with Environstone (trademark), a

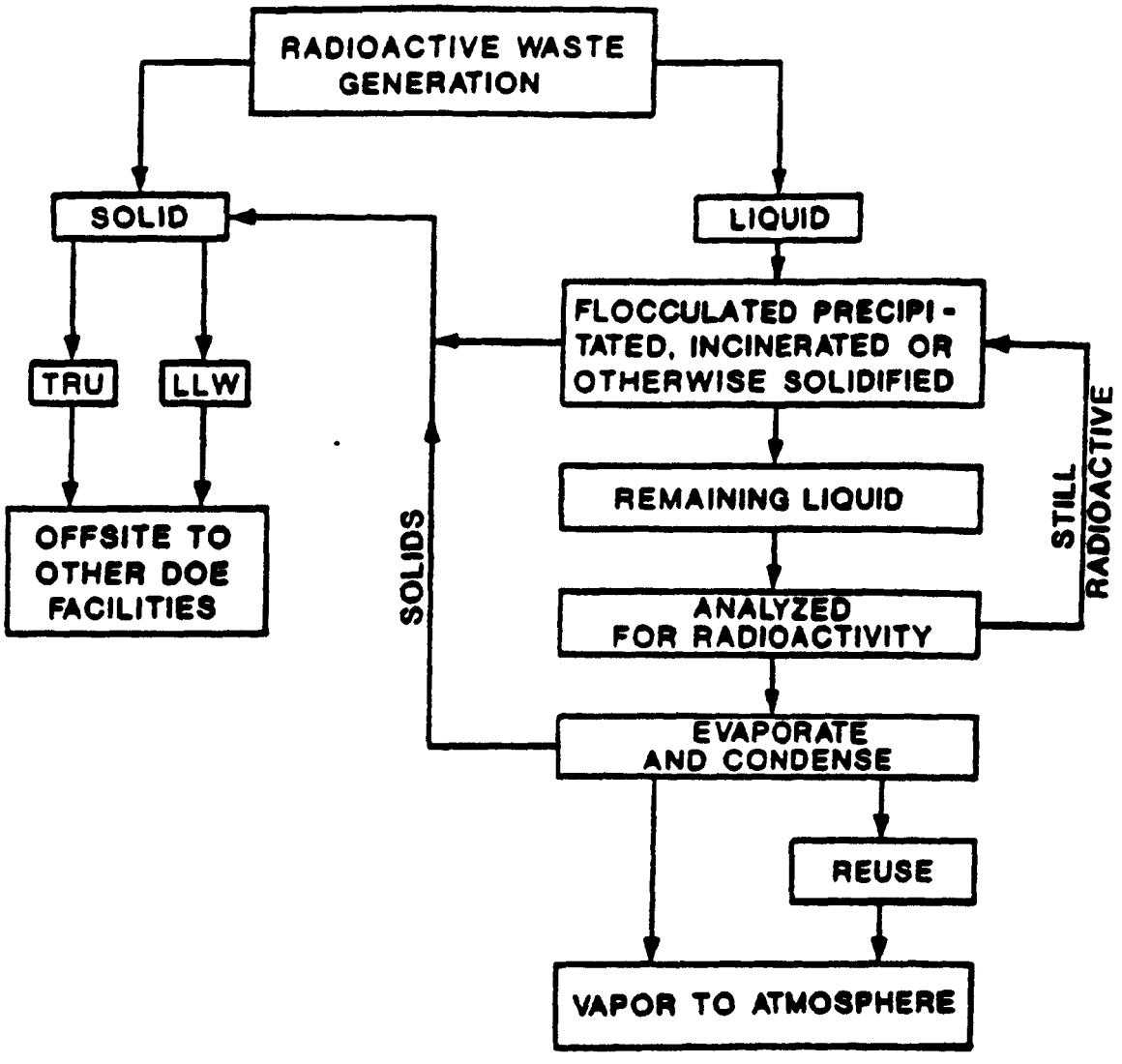

Figure V.1. Conceptual Flow Path for Radioactive Wastes

polymer-modified gypsum cement These solidified liquids are then shipped offsite as radioactive waste (WMSP 1983).

Currently, most of the industrial liquid wastes generated in buildings containing radioactive materials are mixed into the radioactive waste stream. A dual system may need to be installed to allow for separate management of nonradioactive hazardous chemical wastes from these buildings. Rockwell International will perform a feasibility study on the installation of such a system.

Radioactively and PCB-contaminated solids are currently being held onsite awaiting development of an EPA-approved disposal technology (Sec. V B.3 a). DOE is seeking an appropriate disposal method for this waste If appropriate disposal methods have not been identified, feasible alternatives for treatment or disposal of this waste will be proposed under CEARP Phase HI

V.B.2.b.2 Radioactive Waste Management Facilities. Five buildings or parts of buildings are dedicated to handling radioactive waste. The plant also has a radioactive liquid process waste collection system, consisting of pipelines and holding tanks. These systems are double-contained and routinely inspected.

(1) Building 774 is devoted to treating radioactive liquid process wastes Liquid process wastes from plutonium recovery operations conducted in Building 771, and liquid process wastes from machining and other operations are processed in Building 774 The liquids are processed to yield salts, sludge, solids, and water containing residual radioactive contamination The dried salts and sludge are packaged in drums to be shipped offsite to other DOE facilities as radioactive waste. Liquid hydrocarbon wastes are processed into solids and packaged in drums, also to be shipped offsite. The contaminated water is sent to Building 374 for final processing.

Carbon tetrachloride is removed from the waste stream in Building 774 by air sparging. This practice requires evaluation to determine if the quantities of carbon tetrachloride released meet the State of Colorado Air Quality regulations (Sec. IV.D.3).

(2) The new waste treatment facility, Building 374, has replaced Building 774 as the primary radioactive liquid process waste treatment facility. Radioactive chemical process wastes and liquids, such as laundry water and process cooling water, are treated here The liquids are treated by precipitation and evaporation processes that result in a

final product of sludge or salts and distilled water The sludge and salts are monitored, packaged in approved sealed containers, and shipped offsite to DOE facilities as radioactive waste. The distilled water is reused onsite as boiler feed and cooling tower water

(3) Building 776 contains a size-reduction area where plutonium-contaminated, obsolete equipment and used HEPA filters are washed and abraded to remove as much plutonium as possible prior to disposal The cleaned materials are then crushed, cut, or otherwise processed to reduce their volume and are packaged in metal drums or metal boxes as radioactive waste for shipment offsite to other DOE facilities The liquid process waste from the washing operation is filtered and placed in holding tanks. After monitoring, it is piped to Building 374 for treatment. The used filters and sludge from the washing operation are packaged and sent to Building 771 for plutonium recovery.

(4) Building 889 has an area where equipment with uranium contamination is decontaminated prior to being reused, resold, or reduced in size and packaged as radioactive waste for shipment offsite to other DOE facilities. Liquid waste from the decontamination operation is retained in a holding tank. This liquid waste is sampled prior to being transferred to Building 374 for treatment.

(5) Building 664 is used to prepare and load shipments of inspected and accepted drums and boxes of processed solid radioactive wastes for shipment offsite to other DOE facilities.

V.B.2.b.2.a. Liquid Radioactive Waste. Liquids contaminated with radionuclides are carefully controlled, collected, and processed to remove radioactive contaminants. The contaminants are then concentrated, solidified if necessary, and packaged for shipment to another DOE facility as radioactive waste.

Each building that has production, research, or support facilities in which radioactive materials are handled is equipped with a radioactive process waste collection system. This system, which is isolated from the sanitary waste collection system, collects radioactive liquid wastes from such sources as process drains, decontamination showers, laboratory sinks, janitors' sinks, and floor drains located in areas that might be radioactively contaminated. The radioactive process waste collection system also disposes of water used in fire fighting in these areas. The collected radioactive liquid wastes are held in appropriate tanks pending analysis of the contaminants and determination of treatment

Depending on the origin, the waste may be analyzed for plutonium, americium, uranium, hexavalent chromium, beryllium, nitrates, pH, or other contaminants as appropriate

The majority of the plant's radioactive process waste holding tanks are connected by pipeline to the radioactive waste treatment facilities Several buildings that produce small volumes of radioactive wastes are serviced by portable tanks or smaller, closed containers. These radioactive wastes are transported by truck to the radioactive waste treatment facilities.

Organic liquid wastes, machine oils, lubricants, and solvents are collected in separate holding tanks and transferred to the radioactive waste treatment facilities by separate pipelines or containers. Highly toxic radioactive process waste is shipped intraplant in double containment to contain leaks. Low toxicity materials may be moved in stainless steel dumpster equipment.

The majority of radioactive pollutants are removed from the plant's process waste streams by normal chemical processing operations within the plutonium recovery facility The resultant effluents from plutonium recovery operations, together with liquid process wastes from other production buildings, are transferred to one of the radioactive waste treatment facilities. These effluents undergo a chemical precipitation process that produces sludge and radioactively decontaminated liquid, both of which require additional processing The liquid, which contains soluble salts essentially free of radioactivity, is concentrated in a multiple-effect evaporator

The first stage in the operation treats only the liquid from the plutonium recovery process, such as ion column effluent, distillate, americium ion column effluent, caustic scrub solution, hydrochloric acid effluent, condensates, and miscellaneous solutions

Acid wastes are first made basic and the resulting solids are separated from the liquid. The waste liquids are then combined and passed through a precipitation process. Ferric sulfate, calcium chloride, and a coagulating agent are used to form a precipitate with the radioactive contaminants.

The evaporator distillate is recycled to steam plant boilers, cooling towers, or evaporation ponds. The evaporator concentrate is fed to a spray dryer, which converts it to a dry, solid, salt waste. The precipitated sludge is filtered and dried, and the liquid filtrate is recycled to the chemical precipitation operation described above. The solid wastes (dry

salts and sludge) are packaged in drums to be shipped to an offsite DOE facility as radioactive waste

Aqueous wastes not compatible with the above processes are isolated and solidified with cement and an absorbent material in specially prepared drums The drums are referred to as 'cemented waste.'

The second-stage operation handles water from the first stage and all other process water at the plant that requires treatment. The second stage consists of two precipitation processes, one continuous, the other batch The continuous process is used for liquids that are only radioactively contaminated The batch precipitation process is used for all liquids that are chemically as well as radioactively contaminated. Both processes use the same chemical reagents as the first stage The precipitate formed is filtered and packaged in drums as a radioactive sludge.

The treated effluent from both processes is held in isolated tanks until sample data can be obtained. When the plutonium content has been reduced to an acceptable level, the liquid is processed in an evaporator

V.B.2.b.2.b Solid Radioactive Waste. Solid wastes that are radioactively contaminated or are from areas utilizing radioactive materials are (1) packaged for incineration, (2) decontaminated, or (3) crated or drummed to be shipped by truck or train to an offsite DOE facility as radioactive waste Figure V 2 is a flow diagram of the solid radioactive waste disposal process. Where possible, the volume of waste is reduced by compaction, cutting, or disassembly.

Removing solid waste from glove boxes involves transferring the waste through a glove box opening into a plastic bag or sleeve clamped to the opening. The bag is then twisted, taped closed, and cut away. If the bag is left out even for a short period, it is placed in a second bag for added protection. These procedures are supplemented by forced, down-draft ventilation; individually fitted respiratory protection for all personnel; close radiation monitoring surveillance; and protection from external radiation sources Because of its origin, all waste of this type is considered by the Department of Transportation (DOT) to be of 'Not Otherwise Specified' (NOS) activity (formerly HSA or High Specific Activity). 'Low Specific Activity' (LSA) waste has less than 0 1 microcurie of plutonium per gram of waste; NOS waste contains more than 0 1 microcurie per gram

Figure V 2 Solid Radioactive Waste Process Flow Diagram

By plant policy, originators are responsible for minimizing the amount and volume of solid waste generated and for assuring that radioactively contaminated waste shipped to a waste processing area is in a form suitable for processing Solids containing recoverable radioactive material are segregated Solid wastes destined to be shipped offsite must meet all applicable requirements and be inspected by quality acceptance personnel

If solid residues (such as sludge, treated residues, incinerator ash, sweepings, fines, and contaminated tools) from plutonium fabrication, assembly, or recovery processes contain recoverable amounts of plutonium, they are further processed through plutonium recovery operations. Remaining wastes are packaged as radioactive waste in drums for shipment offsite to other DOE facilities.

Sludge that is continuously removed from the waste treatment rotary-drum filters is packaged in 55-gal, plastic-lined drums. Solid residues (salts) from the waste treatment spray dryer are cemented and packaged in tri-wall corrugated fiberboard boxes prior to shipment offsite to other DOE facilities. Solid wastes are packaged for shipment in accordance with established, written procedures.

Solid wastes are segregated into several categories for packaging according to (a) density and chemical composition, (b) the amount and kind of radioactive material involved, if any, and (c) physical characteristics, such as bulk, weight, shape, and sharp edges or points that could affect packaging. The general packaging procedures begin with radiation monitoring personnel determining if wastes are, in fact, contaminated. If they are, the personnel determine the level and kind of radioactive contamination and record that information for waste management.

All waste packaging materials are subject to inspection and acceptance by quality assurance personnel. In addition, the originator of the waste inspects each drum to ensure that it is free from punctures, rust, and corrosion Each drum lid must have a gasket and the sealing surfaces of the drum and lid must be free of any nicks, dents, or steps at the seams that could result in leaks. Shipping boxes are similarly inspected to assure they are sound and undamaged.

Depending on the type of waste and level of radioactive material present, various arrangements of liners are used inside the drums and boxes to provide double contain-

ment These liners are generally polyethylene or polyvinylchloride plastic Each drum and box is marked with a unique number and the identity of its contents

A radioactivity assaying instrument (drum counter) provides information to assure that drums containing residues for processing at the plant are not intermingled with drums containing processed waste to be shipped offsite.

After wastes are packaged and before they are shipped, radiation monitoring personnel monitor the outside of the containers to assure they are free of surface radioactive contaminants and that the amount of penetrating radiation is within established guidelines.

Waste management personnel thoroughly inspect the packaging for compliance with all applicable federal (DOE and DOT) requirements.

V.B.2.b.2.c. Radioactive Gases. The emissions given off by various plutonium recovery and other processing operations (such as incineration and residue dissolution) may contain small amounts of particulates of plutonium or other radioactive materials. The concentration of particulate radioactive material contained in such process emissions is reduced to levels 'as low as practicable' by prefilters, chemical scrubbers, and multiple-stage HEPA filters before emission to the atmosphere.

All process and ventilation air streams from buildings processing or storing radioactive materials pass through HEPA filters before being discharged to the environment The building ventilation exhaust systems have two types of radioactive particulate monitoring systems One type is a selective alpha air monitoring system (SAAM) that actuates alarm signals at preset levels, enabling personnel to initiate corrective actions to mitigate a release of particulate radioactive material to the environment. The second type of system uses multiple fixed-head particulate samplers and an air velocity probe and recorder to collect and record volumetric flow-rate data. Using the flow-rate data and laboratory analyses of the samples, the total particulate radioactive material discharges to the atmosphere can be calculated. In some buildings, a third system monitors the exhaust effluent for tritium gas.

V.B.2.c. Nonradioactive Hazardous Chemical Waste. Nonradioactive hazardous chemical wastes are not disposed of at the plant, except for asbestos (discussed later in this section). These wastes are commercially disposed of, commercially recycled,

or mixed with the radioactive waste stream and treated in the radioactive waste treatment facilities and shipped offsite to other DOE facilities as radioactive waste. Nonradioactive hazardous wastes or substances treated as radioactive waste are those generated in buildings containing radioactive materials listed in Table V 1. Figure V 3 shows disposal pathways for nonradioactive hazardous chemical waste or substances. Table V 6 shows typical classes and annual quantities of nonradioactive hazardous chemical wastes or substances (excluding those treated as radioactive waste) managed at the plant (HWIP 1983).

As shown in Table V 6, the nonradioactive hazardous chemical waste generated at the plant is approximately 88% used oil, 5% radiographic solutions, 3% beryllium, 2% paint and paint solvent, 1% carbon tetrachloride, and 1% miscellaneous materials.

Used oil, scrap beryllium, and chlorinated hydrocarbon solvent wastes are recycled by commercial contractors. Those that are not recycled (those generated in buildings containing radioactive materials) are processed with the radioactive waste and shipped offsite. Paint and paint solvent wastes are also recycled by commercial contractors; those that cannot be recycled are processed as radioactive waste. Radiographic solutions are processed to recover silver, and the stripped solution is processed as radioactive waste. Liquid PCBs and solid wastes contaminated with PCBs are manifested and sent to EPA-permitted disposal facilities. All nonradioactive RCRA and TSCA hazardous chemical wastes or substances held onsite awaiting offsite commercial disposal are kept in storage facilities designed to meet RCRA and TSCA requirements.

There are a couple of small photographic shops at the plant that do not process enough film to require special handling of the spent photographic solution. These spent solutions are disposed into the sanitary sewer system.

Asbestos was used in the older buildings for insulation and heating systems. Asbestos waste is being disposed of onsite at the present landfill in an area designated for asbestos disposal, in accordance with EPA specifications under NESHAPS (40 CFR Part 61).

V.B.2.c.1. Nonradioactive Hazardous Chemical Waste Storage Facilities. Four steel cargo containers, 20 x 8 x 8 ft, fitted with air vents, electrical ground, and 7-in-deep catch basins are used to store nonradioactive hazardous chemical waste. These storage facilities were designed to meet RCRA requirements. Chlorinated

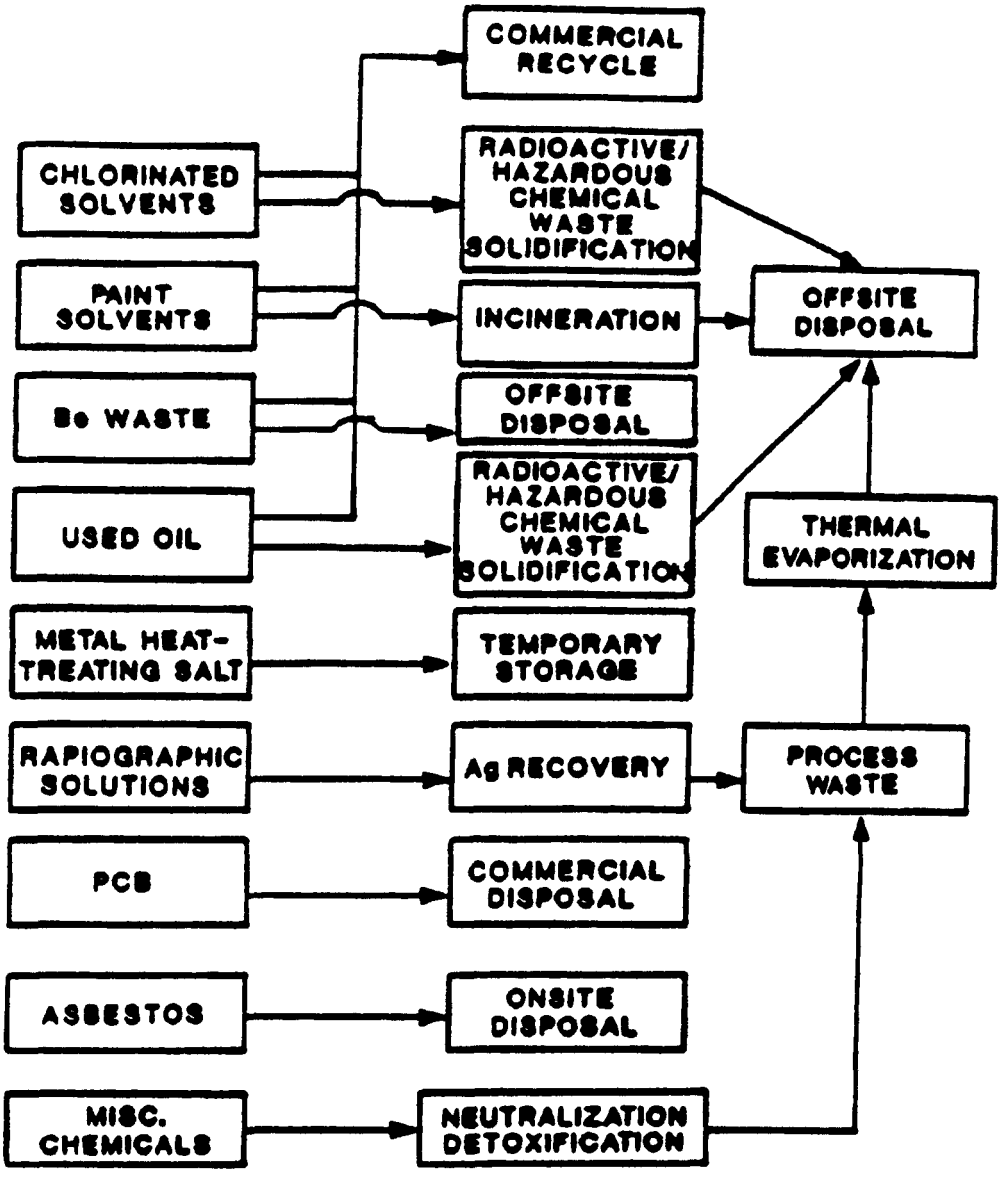

Figure V.3. Flow Chart for Hazardous Waste

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Table V 6 Typical Hazardous Materials Managed Annually*

RCRA Hazardous Waste

Waste Material	EPA HW Number	Initial Inventory	Generated	Shipped	Final Inventory
Carbon tetrachloride	F001**	450 gal	--	450 gal	--
Dichloroethane	F001	--	60 gal	--	60 gal
Trichloroethane	F001	20 gal	--	20 gal	--
Used paint solvent	D001	--	420 gal	165 gal	260 gal
Surplus paint	D001	--	300 gal	--	300 gal
Polyester resin	D001	--	50 gal	--•	--
Radiographic solutions	D011	100 gal	2,400 gal	--••	1,000 gal

NESHAPS Regulated Material

Waste Material	Initial Inventory	Generated	Shipped	Final Inventory
Beryllium scrap	--	10,400 lbs	10,400 lbs	--
Used oil	--	42,000 gal	42,000 gal	--

TSCA Regulated Material

Waste Material	Initial Inventory	Generated	Shipped	Final Inventory
PCB				
Solid Waste	2 drums	--	2 drums	--
Liquid Waste	3 gal	1 gal	4 gal	--
Capacitors	--	13	13	--
Transformers	--	1	--	1

* Quantities listed in this table are approximations based upon data from calendar year 1983.
** The EPA hazardous waste numbers correspond to those listed in the current RCRA Part A application, May 31, 1985.
• Reused onsite.
•• Processed 1,500 gal onsite to recover silver.

solvents, paints, and ignitable solvents have been stored in the remote storage area Storage times have varied from 3 months to more than a year PCB waste and metal heat-treating salt (oxidizer) have been stored in the cargo containers located within the security zone. Storage times for PCB waste have exceeded 3 years in the past. Future storage times for these wastes are not expected to exceed 1 year. The hazardous waste storage locations are shown in Fig V 4

V.B.2.c.2. Nonradioactive Hazardous Chemical Waste Treatment Facilities. Two chemical laboratories onsite can detoxify small amounts of nonradioactive hazardous chemical waste (on a small bench scale-size operation) when needed. This facility was addressed in the RCRA Part B application. Reaction products from the laboratory treatment are disposed of as radioactive waste because radioactive materials are handled in the laboratories. Nonradioactive hazardous chemical wastes that have been disposed of in this manner include pyrophoric metals, small cylinders of toxic gases, and reactive chemicals. Records for this treatment appear among the radioactive waste records because the ultimate disposal is with the radioactive waste.

V.B.2.d. Nonradioactive Nonhazardous Waste. Solid wastes from all areas of the plant where little or no possibility of radioactive or chemical contamination exists are placed into transportable metal containers (Dempster Dumpsters) and are emptied into the present onsite sanitary landfill. Nonradioactive solid wastes from areas with possible radioactive contamination are monitored before being placed into locked containers This prevents radioactive material from entering the nonradioactive waste stream. Materials taken to the present onsite landfill in the locked containers are spread and remonitored daily before burial to ensure no radioactive materials are present. These materials include scrap wood, nonrecoverable scrap metal, paper, carbon, graphite, garage rubbish, medical wastes (no biological hazard), empty gas cylinders (that cannot be reused), empty chemical containers, cafeteria garbage, and clarifier grease removed from sewage during treatment.

Two landfills are located at Rocky Flats Plant: the original, south, onsite landfill (closed) and the present, north, onsite landfill (active). These landfills have received most of the nonhazardous, nonradioactive solid wastes generated at the plant.

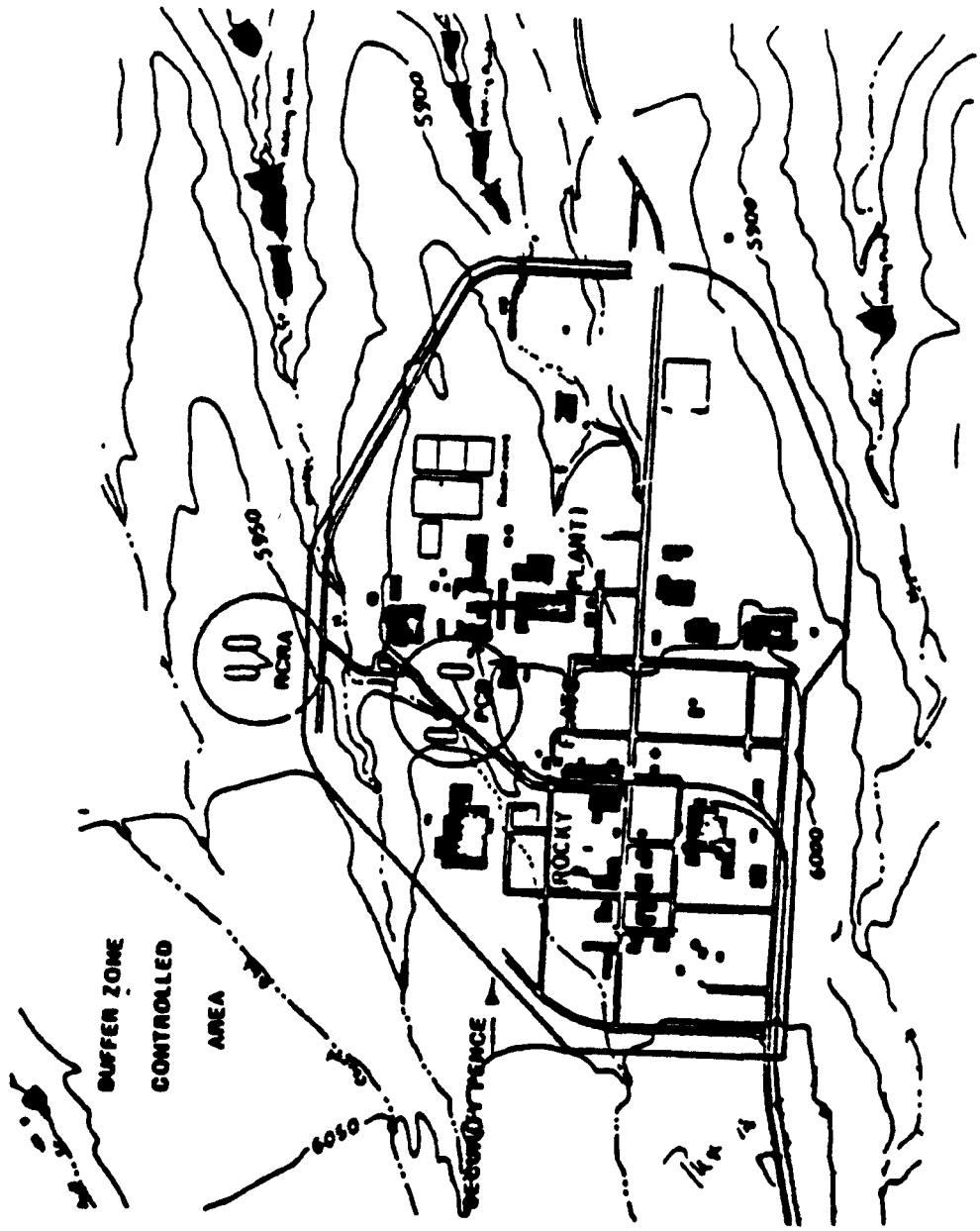

Figure V 4 Waste Storage Areas

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Current management practices for disposal of solid sanitary (nonhazardous and nonradioactive) wastes are well documented (WMSP 1983) These wastes are all disposed of onsite, and do not present a hazard to the environs of the plant.

V.B.2.e. Sanitary System. Very little liquid effluent is released offsite from current sanitary system operations at the plant. Sanitary effluents are processed through a tertiary sanitary treatment system. Effluent from this system meets all requirements for offsite release under limitations set forth in the existing NPDES permit However, some of the water is retained onsite and further treated in the reverse osmosis (RO) plant or stored in retention pond B-3 Treated water from the RO plant is stored to use as cooling tower makeup water. The brine from the RO plant is mixed with the process waste stream and evaporated in the radioactive waste treatment facility. Water stored in retention pond B-3 is sprayed onto arid areas of the plant site.

Prior to 1979, tertiary treated sanitary waste water (the tertiary system was installed in the mid-1970s) was discharged routinely to South Walnut Creek in accord with conditions of the NPDES permit in effect at that time. Retention ponds B-1 and B-3 were used for temporary impoundment until the water could be analyzed prior to discharge downstream. This practice was discontinued when the RO plant was built, and retention pond B-1 is no longer used.

From 1969 to about 1973, laundry effluent that contained less than 1,600 dpm/l alpha activity and was low in nitrates was routed through the sanitary treatment system This effluent is currently transferred to the radioactive liquid waste stream for treatment The sanitary waste treatment process removed residual radioactive material from the liquid fraction and concentrated it in the sludge. Radioactive materials have not been introduced into the sanitary system for more than 10 years; however, very low residual radioactivity is still present. Prior to 1969, sanitary sewage sludge was either buried in trenches or disposed of in the present onsite landfill. Since that time it has been packaged and shipped offsite to a DOE disposal facility as radioactive waste. Prior to 1983, small amounts of the dried sludge became airborne and were dispersed around the drying beds during packaging operations (see Sec. V A 3 aa for a discussion of sanitary sewage sludge dispersal). These operations are now conducted in an enclosure.

The sewage treatment facility, Building 995, has had surge overflows (a peak load flow larger than the capacity of the plant) caused by groundwater infiltration into the

system These events have not resulted in the sewage plant being bypassed, but have increased effluent flows through the outlet into South Walnut Creek to and through the B-series retention ponds and into the stream channel To prevent excessive groundwater infiltration, upgrading the existing sanitary collection pipe system was started in 1985 Because groundwater was able to infiltrate this system, the potential exists for contaminants from the system to migrate into the groundwater's pathway

Sanitary system operations are documented by daily reports, and no major changes in this operation are indicated. Documentation of any potential problems from past sewage sludge dispersal and specific recommendations for further action, if indicated, will be provided under CEARP Phase II (Sec. V A.3.aa) In addition, the sediments of the retention ponds will also be evaluated to determine if hazardous pollutants are present (see Sec. V A 3 i)

V.B.3. General Information. Several items are of general interest or are not located within one specific area of the plant. These items are discussed here.

V.B.3.a. PCBs. Approximately 10,000 gal of PCB is in use in electric utility system components (including transformers and capacitors) and hydraulic systems at the plant. These items have been marked as containing PCB in accord with TSCA regulations. In addition, there are two small storage areas for holding nonradioactive PCB (both liquids from changing oil in equipment and PCB-contaminated solids such as transformers and capacitors) until these materials can be shipped to EPA-approved PCB disposal facilities.

Since the plant began operations, all large transformers have been diked, and no major leaks have occurred. No records prior to the late 1960s exist on replacement of small transformers or capacitors, on types of oil they may have contained, nor on their disposal. One person interviewed indicated that some of these items may have been placed into the scrap metal site west of Building 559. This site was removed while the personnel security zone (PSZ) was being constructed in the early 1980s, and no transformers or capacitors were found. All the material removed was disposed of at the present on-site landfill (Sec. V.A.3 c).

Currently, no radioactive, PCB-contaminated liquid exists at the plant. The last of this material was shipped another DOE facility for disposal by incineration during the

summer of 1984. Currently, about 14 drums of solid radioactive, PCB-contaminated material (kim wipes, coveralls, transformers, capacitors, etc) are being stored awaiting an EPA-approved disposal technology

No releases of PCB into the environs at the plant are known to have occurred The only indicated action regarding PCB at the plant is to obtain EPA approval for disposal of radioactive, PCB contaminated solids. DOE is seeking this approval If an acceptable disposal approach is not identified, alternatives for disposal will be sought under CEARP Phase III

V.B.3.b. Sanitary Sewage Sludge. Sanitary sewage sludge has been disposed of in three separate ways since plant operations started: 1) burying it in trenches (1954 to 1968); 2) burying it in the present onsite landfill (1968 to 1969); and 3) having it drummed and shipped offsite to another DOE facility as radioactive waste (1969 to present) The plant will continue to ship all sanitary sewage sludge offsite for disposal as radioactive waste. CEARP Phase II will undertake to characterize any sludge that may remain around the drying beds (Sec. V.A.3.aa).

V.B.3.c. Biocide Use. Biocides are used on the plant site (following requirements promulgated under Article 10, Title 35 of the Colorado Statutes of 1973 as amended) to control pests and weeds. All pest and weed control is performed in accordance with procedures outlined in the Health, Safety, and Environment Manual and are coordinated with the Jefferson County Extension Service and the State of Colorado Department of Agriculture. The Industrial Hygiene Group documents materials used, trains employees, and monitors application procedures and the disposal of biocides, equipment, and containers. All biocides are stored in a dedicated, locked building, that has adequate containment for possible spills (as required by 40 CFR Part 165) Application procedures, including rates of application, are reviewed by industrial hygiene personnel to assure compliance with registered pesticide requirements of the State of Colorado. No further action on use of biocides is indicated for CEARP Phase II.

V.B.3.d. Beryllium. The plant began production use of beryllium metal in 1958, and use of this material continues to the present. The total release of beryllium from stacks at the plant is less than 1 g/yr (AEMR 1985). By comparison, the allowable limit set by the EPA is 10 g/d per single source. Air pollution emission notices

(APENs) have been submitted for all the plant's beryllium sources to the state as required by Colorado State Air Pollution Control Regulation No 3

Rockwell International performed an assessment of beryllium levels in surficial soils near the plant in 1982 (Barrick 1982). This study was initiated because of the general lack of knowledge concerning beryllium levels in soils nationwide, and because surficial soils near the plant provided an integrated record of beryllium deposition from the plant's operations and other nearby sources. Identified possible sources included the plant, a beryllium ore industry 1 2 mi east of the plant, a beryllium ceramics industry 9 mi south of the plant, various coal producing or combustion sites nearby, and the heterogeneous geologic materials underlying the plant. This study indicated that no surficial soils near the plant have detectable beryllium accumulations, and that background beryllium content of surficial soils is dependent upon soil type.

Anomalously higher background beryllium levels were found near the plant's roads and buildings. The study concluded that the beryllium loading was attributable to surficial gravel aggregates which are higher in beryllium content. These aggregates have been increased by (1) adding sand and gravel for construction purposes, and (2) soil denuding from increased erosion around these construction sites (the clay is removed leaving the gravel aggregates).

The study found one area, 10 to 20 yd^2, that contained beryllium accumulations above background that were attributable to plant operations. This area is located adjacent to Building 444, and Building 444 was used for beryllium operations. Maximum levels found were 114 micrograms per gram as compared to background levels of 1 microgram per gram. The study indicated that no health risk was suspected, but that removal of 1 yd^3 of soil would bring the levels back down to background. No further action on beryllium operations is indicated under CEARP Phase II (Barrick 1982).

V.B.4. Pathways for Environmental Release. The plant has three pathways by which material from plant operations can be released into the local environs. These three pathways are air, surface water, and groundwater.

V.B.4.a. Air Pathway. Materials (particulates and vapors) may enter the air pathway from stack emissions, open impoundments, and exposed soil surfaces. One example of airborne material transfer is the documented plutonium dispersal from the 903

drum storage area (RFEIS 1980) Another example is spray from the 207 solar evaporation ponds (Sec. V A 3 h).

As described in Sec III A general windflow patterns surrounding the plant are well documented, and wind direction frequency data are included in the annual environmental monitoring reports. Annual average and accident atmospheric dispersion factors have been calculated to evaluate routine and unplanned releases at the plant (RFEIS 1980) Several ongoing studies of resuspension and plume dispersion are being performed at the plant (Hunt 1982, Hunt 1983, Hunt 1984, and Hodgin 1984) and a site-specific dispersion model is being developed for regulatory and emergency response to supplement atmospheric release advisement capability (ARAC) models (Hodgin 1985).

Currently, a data base on plant-wide releases of all stack emissions does not exist. Rockwell International is compiling a data base of all materials received, disposed, and used in product. This data base will enable rough estimates of air releases to be made from material balances. Any potential problem areas identified by this analysis will be evaluated, and if necessary, corrective actions will be implemented.

The air pathway has been adequately characterized and documented. Additional air pathway characterization studies will not be performed under CEARP

V.B.4.b. Surface Water Pathway. Sheet flow runoff from the plant (buildings, roofs, parking lots, storage and open areas) is collected in artificial and natural channels that eventually discharge into retention ponds in North and South Walnut Creek, and Women Creek. Bed sediments remain in the retention ponds, and most, if not all suspended sediments settle out rapidly in the retention ponds. Concentrations of contaminants, if present in solution in the retention ponds, are diluted by surface water or by effluent releases to the ponds.

Additional information regarding the surface water's pathway in relation to identified waste sites will be collected under CEARP Phase II. Surface drainage at the plant will also be characterized to more accurately determine run-on, runoff, and drainage destination of surface water from any given waste site. Additional measurements for hazardous pollutants (radioactive and nonradioactive) in surface water leaving the plant and areas upstream from the plant will be obtained under CEARP Phase II (this includes organics, metals, solvents, radioisotopes, etc) These data will be used to complete under-

standing of hazardous pollutants that may be entering the surface water's pathway, and to determine if a significant pollution hazard exists If necessary, the surface water drainage will be followed upstream at least to the plant's property boundary to confirm and characterize the source of any hazardous pollutants.

V.B.4.c. Groundwater Pathway. Contaminants (liquid or solid) spilled on or buried in the ground at Rocky Flats Plant may be subject to resuspension and transport by water infiltration into the shallow aquifer The rate of movement to the aquifer is highly dependent upon the nature and quantity of the contaminant and the hydrologic properties of the soil and substrata Contaminants could be adsorbed by silts and clays in the gravels that form the aquifer If buried wastes are in contact with water, solution concentrations of the contaminant will vary based on contaminant solubility, contaminant concentration, and water contact time

Additional information regarding the groundwater's pathway in relation to identified waste sites will be collected under CEARP Phase II. Additional characterization on depth, direction and rate of movement, recharge, and discharge of the shallow aquifer is needed. Additional groundwater data are currently being collected and will be evaluated to determine where additional data are needed for the characterization. This characterization will require relating the locations of all monitoring wells to potential contamination zones and evaluating the data for gaps and trends identifying locations that may require placement of additional monitoring wells. These data will also be used to determine where and how fast groundwater moves in areas at the plant. This analysis will indicate which locations need to be sampled to adequately determine background levels and to confirm the presence or absence of any contributions from the plant to hazardous pollutants that may be present in local groundwater

V.B.5. Monitoring Program. The plant conducts an environmental monitoring program that includes sampling and analyzing airborne effluents, ambient air, surface water, groundwater, and soil. External penetrating gamma-radiation exposures are also measured using thermoluminescent dosimeters. The environmental monitoring program consists of collecting samples from onsite, boundary, and offsite locations. Ambient air quality, surface water quality, and groundwater quality measurements are also performed Specific details of the routine plant monitoring program are documented in the "Catalogue of Monitoring Activities at Rocky Flats" (RI 1985)

Several federal, state, and local governmental agencies independently conduct additional onsite and offsite environmental surveys The Colorado Department of Health samples air, soil, and water at the plant and in surrounding communities. It also operates an onsite, continuous, particulate air sampler for the Jefferson County Health Department. The DOE Environmental Measurements Laboratory (EML) conducts particulate air sampling at the plant and periodically performs special studies, including sediment and soil analyses.

The reliability and credibility of analytical laboratory results (quality control) are established by including as an integral part of any analytical procedure a program of scheduled replicate analyses of standard or spiked samples. The precision of analytical results is established as the standard deviation from true values or from the mean of replicate analyses. Accuracy is reported as the percent recovery of a constituent from a sample of known value with a given analytical procedure and analyst. In addition, the Rocky Flats Plant laboratory participates in the EPA and National Bureau of Standards' (NBS) quality assurance/quality control (QA/QC) audit programs each year. Second, the independent sampling by federal, state, and local government agencies allows for cross-comparison of data sets that have been independently collected and analyzed. This is an excellent external check of both sampling and analytical procedures (quality assurance)

V.B.5.a. Air Monitoring. The plant monitors air effluents for both radioactive and nonradioactive contaminants. Radioisotopes examined include plutonium-239, plutonium-240, uranium-233, uranium-234, uranium-238 and tritium. Each month a composite sample from each of the 43 exhaust systems is analyzed for beryllium Extractive instrumentation is being used to monitor for sulfur dioxide, total hydrocarbons, carbon monoxide and carbon tetrachloride in selected ventilation exhaust systems Also, continuous stack monitors measure oxides of nitrogen concentrations.

The plant has an ambient air quality monitoring station measuring all six EPA criteria pollutants: total suspended particulates, sulfur dioxide, carbon monoxide, ozone, lead, and nitrogen dioxide. The station is located in a mobile van. Except for ozone, the measured concentrations are below National Ambient Air Quality Standards. The measured ozone concentrations are similar to those found in the other areas of metropolitan Denver. The photochemical oxidant problem is an area-wide problem primarily caused by regional transportation sources. The contribution to this ozone problem from operations

at the plant is small; the plant's input is primarily from commuter traffic to and from work.

The Colorado Air Quality Control Commission, in an effort to control ambient levels of ozone in the greater metropolitan areas, has placed more restrictions on volatile organic compounds. These restrictions, promulgated under Regulation 7, Part IV, Sec. C., of the Colorado Air Quality Control Act, may have increasing effects on the plant's use of solvents and on how releases of vapor from these solvents to the atmosphere are controlled.

The Colorado Air Quality Control Act requires the plant to have permits to operate its incinerators. These permits have emission limitations that require verification using continuous emission monitors. To qualify as a continuous emission monitor (CEM), it must undergo performance testing procedures that include EPA reference methods (manual tests) (40 CFR Part 60, Appendix B). These methods require sampling before, as well as after, the control device. This presents a unique problem at Rocky Flats Plant because the exhaust before the HEPA filter control device is radioactive. Due to the specialized nature of the reference method tests and the equipment it requires, Rockwell International will explore having these tests performed by an outside contractor who specializes in this testing or DOE will seek a variance from these procedures from the appropriate regulatory agency.

V.B.5.b. Surface Water Monitoring. Annual environmental monitoring reports at the plant show that radiological sampling of surface water is adequate both in frequency of collection and type of constituents analyzed (see Sec. III.E on water quality) (AEMR 1983, AEMR 1984, AEMR 1985). Data for some nonradioactive constituents have been collected; however, these data have not been given in the annual environmental monitoring reports. The plant will include data on nonradioactive materials in future annual environmental monitoring reports as per draft DOE order 5484.1. Sampling collection stations will be expanded to include background samples upstream from plant operations. The specific sampling locations and concentrations of PCBs for surface water will be identified in addition to those identified in past and present NPDES permits. The adequacy of the surface water monitoring program will be further evaluated under CEARP.

V.B.5.c. Groundwater Monitoring Annual environmental monitoring reports at the plant show that radiological sampling of groundwater is adequate both in

frequency of collection and type of constituents analyzed; see Sec III E on water quality (AEMR 1983, AEMR 1984, AEMR 1985) Data for some nonradioactive constituents have been collected; however, these data have not been reported in the annual environmental monitoring reports. The plant will include data on nonradioactive materials in future annual environmental monitoring reports as per draft DOE Order 5484 1 Sampling collection stations will be expanded to include background samples from wells located upgradient from plant operations. The specific sampling locations and concentrations of PCBs for groundwater will be identified. The adequacy of the groundwater monitoring program will be further evaluated under CEARP.

V.B.5.d. Soil and Sediment Monitoring. Soil sampling for radionuclides from operational releases appears to be adequate in frequency and selection of constituents. Additional data have been collected from both Great Western Reservoir and Standley Lake to address plutonium concentrations in reservoir sediment as related to the plant's operations (Setlock 1983, Setlock 1985c). Sediment core profiles show plutonium concentrations peak at depth (past deposition), and indicate that no post-depositional migration is occurring in the sedimentary column (the plutonium is fixed to particulates at depth). Sedimentation rates vary from 0.5 to about 0.8 in/yr in these reservoirs.

Radioactive and chemical characteristics of sediment from onsite stream drainages and retention ponds are not reported in the annual environmental monitoring report. The plant has collected and analyzed samples both up and downgradient from the plant for radionuclides, specific trace metals, and organics that can be related to the plant's operations. These data will be included in future annual environmental monitoring reports as per draft DOE Order 5484.1. The adequacy of the soil and sediment monitoring program will be further evaluated under CEARP.

V.B.6. Documentation. Expanded documentation appears to be needed for several activities at the plant. In addition to indices of hazardous materials used onsite, inventories of hazardous materials purchased are being collected by the industrial hygiene group as part of OSHA requirements (hazardous materials standards). Disposal information is maintained, but this information has not been published. Summaries of these data will be included in the annual environmental monitoring report as per draft DOE Order 5484.1. These data will be used to demonstrate compliance with the various federal and state regulations governing releases of hazardous pollutants into the environment.

V.B.6.a. CERCLA Reporting Requirements. Sections 103(a) and 103(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) require that the National Response Center be notified immediately when hazardous substances or oils are released into the environment in quantities equal to or greater than the reportable quantities set in Sec 102(b). When this law was established in 1980, reportable quantities were set at 1 lb for hazardous substances, except for those for which reportable quantities had been established pursuant to Sec. 311(b)(4) of the Clean Water Act (CWA) On Apr. 4, 1985, 40 CFR Part 302.4 adjusted the reportable quantities for many of the hazardous substances. Future monitoring activities at the plant will evaluate routine and accidental releases with respect to reportable quantities, and any releases exceeding these limits will be reported to the National Response Center The annual environmental monitoring report will include a listing of reports made or a statement showing compliance with this reporting aspect of CERCLA.

V.B.6.b. NESHAPS Reporting Requirements. Asbestos was used in the older buildings for insulation in heating systems. NESHAPS (see Sec. IV) have emission control, disposal, notification and reporting requirements for removing asbestos. Delegation of authority to the State of Colorado for this national regulation is covered under Colorado State Air Pollution Control Regulation No. 8. Subcontractors for removing asbestos are required to provide appropriate notification to the EPA and State of Colorado. DOE will implement a procedure to document such notification.

V.B.6.c. Radiometric Survey of the Plant. A radiometric survey was conducted from 1975 to 1983, prior to new construction, to identify and remove surface radioactive contamination on the plant site. As radioactive material was discovered, it was removed. This survey has been documented by monthly memos-to-file, but a summary report has not been prepared. CEARP Phase I supplemental activities will compile these data into one report that lists all sites and identifies remedial action status. The report will demonstrate removal or absence of surface radioactive contamination (except for isolated locations within the 900 Area) or identify areas warranting further action under CEARP Phase II. Documentation for the cleanup necessary for remaining locations will be included in the plant's annual monitoring report, pursuant to draft DOE Order 5484.1, as significant environmental activities conducted at the plant site.

V.B.6.d. Underground Storage Tanks. The 1984 amendments to RCRA provide regulation for underground storage tanks used for oils or hazardous sub-

stances, including radionuclides, currently in use or taken out of service in the last 10 years This law requires notifying the state or local authorities of the age, size, type, location, and uses of each tank by May 8, 1986 A complete inventory of underground tanks at the plant showing dates of service, materials of construction, liquids stored, and current contents of the tanks is needed. Rockwell International is compiling the tank inventory

V.B.6.e. Maps and Photographs. Current aerial photographs and detailed scaled drawings of the plant site were not located during CEARP Phase I. If adequate maps and drawings cannot be obtained from subcontractors that have performed work onsite, a mapping exercise will be done under CEARP Phase II.

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APPENDIX A - PROFESSIONAL QUALIFICATIONS OF INSTALLATION ASSESSMENT TEAM

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CEARP Responsibilities: Meteorology

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CEARP Responsibilities. Team Leader
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CEARP Responsibilities: Reviewer

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CEARP Responsibilities. Project Leader and Manager
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APPENDIX B

HAZARD RANKING SYSTEM AND MODIFIED HAZARD RANKING SYSTEM SCORES FOR ROCKY FLATS PLANT

B.I. General Information

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA P L 15-510) requires federal agencies to identify to the Environmental Protection Agency (EPA) inactive sites under their control that may be sources of environmental contaminants Such sites could include inactive waste disposal sites, facilities, or other locations that were contaminated by hazardous or toxic materials in the past As one means of establishing the relative importance of such sites, the EPA promulgated the Hazard Ranking System (HRS) as Appendix A of 40 CFR 300 The relative ranking of sites at various installations can serve to highlight particular problems or suggest priorities for further investigation

The HRS was designed by EPA to be used to "evaluate the relative potential of uncontrolled hazardous substance facilities to cause health or safety problems, or ecological or environmental damage" (Sec 1.0 40 CFR 300, Appendix A). The following excerpts from the regulation indicate some of the limitations of the system.

> "The HRS is a means for applying uniform technical judgment regarding the potential hazards presented by a facility relative to other facilities It does not address the feasibility, desirability or degree of cleanup required."

> "The HRS does not quantify the probability of harm from a facility or the magnitude of the harm that could result, although the factors have been selected in order to approximate both those elements of risk. It is a procedure for ranking facilities in terms of the potential threat they pose..."

The HRS assigns three hazard mode scores to a site; (1) a Migration Mode Score that reflects the potential for harm to humans or the environment from migration of a hazardous substance by either groundwater, surface water, or air pathways; (2) a Fire/Explosion Mode Score that reflects the potential for harm from substances that can explode or cause fires; and (3) a Direct Contact Mode Score that reflects the potential for harm from direct contact with hazardous substances at the site The score for each mode

is obtained by evaluating a series of factors that characterize the potential of the facility to cause harm Each factor receives a numerical value according to a predetermined scale; the factor values are weighted and combined to yield final scores according to set rules The Migration Mode Score was used by EPA in establishing the National Priorities List (NPL) of facilities in the private sector for initial attention under CERCLA Federal sites are now proposed for inclusion on the NPL, and all sites with scores greater than 28 5 will be included The Fire/Explosion and Direct Contact Mode Scores are intended by the EPA to identify facilities requiring emergency action

The Migration Mode Score is a composite of the separate scores for each of the three migration routes; groundwater, surface water, and air Each migration route score is calculated by multiplying selected factors for route characteristics, containment, waste characteristics, and potentially affected targets to arrive at a value on a normalized 0 to 100 scale The overall Migration Mode Score is the root mean square of the three route scores, which emphasizes the highest scoring route, and is also on a 0 to 100 scale. Higher scores are expected to indicate a greater potential for problems However, as suggested by the acknowledged limitations, the Migration Mode Scores are useful principally for ranking sites for priority of follow-up actions and do not quantify risk.

For many DOE installations there is a particular problem in applying the HRS to sites that may have radioactive contamination The HRS does not contain provision for comparing radioactive materials with toxic and hazardous chemicals. As a result, DOE headquarters engaged Battelle Pacific Northwest Laboratories to develop a modification to the HRS that would more appropriately account for the relative risks of radioactive and nonradioactive contaminants. This modification was used in evaluating sites at the plant that contain radioisotopes

B.II. Summary and Conclusions

The Rocky Flats Plant was evaluated to determine the relative potential of hazardous substances to cause adverse effects on human health or the environment. The evaluation was conducted using the EPA Hazard Ranking System (HRS) for hazardous chemicals and the DOE Modified Hazard Ranking System (MHRS) and EPA HRS for radionuclides. The evaluation consisted of two steps: (1) an overall evaluation of the risk of the plant relative to other National Priorities List (NPL) sites (Migration Mode Scores

greater than 28 5), and (2) an evaluation of individual sites within plant boundaries to determine relative hazards

Because the plant is located on two separate surface water drainages with different public receptors, the overall evaluation consists of two aggregate scores created from lumping sites with common receptors together Aggregated scores for the Walnut Creek drainage and the Woman Creek drainage were achieved by taking the worst case situation (e g compounds with maximum toxicity and persistence, minimum containment conditions, observed releases, and shortest distance to water users) from each of the sites and total waste quantities from all of the sites This technique is consistent with guidance provided in the EPA Users Manual The chemical Migration Mode Scores for the two aggregated evaluations of the drainages at the Rocky Flats Plant exceed the 28 5 threshold for placement of sites on the NPL The Walnut Creek drainage received the highest chemical Migration Mode Score, 53 (see Table B 1) The hazard contribution from radionuclides is comparatively small (i e the radionuclide Migration Mode Score is 9)

Individual site hazard ranking evaluations were performed for the eleven sites with sufficient information to permit scoring Six of the sites evaluated are waste disposal areas, four are potentially contaminated areas from prior waste treatment or storage activities, and one is the aquifer contaminated with volatile organic compounds (VOCs) The scores are summarized in Table B 1. Of the eleven individual sites evaluated, only three (solar evaporation ponds, VOCs in groundwater, and present landfill) received scores which exceed the 28 5 threshold The Direct Contact Mode Scores for all individual sites, except the solar evaporation ponds, are zero, reflecting adequate waste cover and site exclusion The Fire/Explosion Mode Scores for all individual sites are zero, reflecting no apparent fire or explosion threat.

The Hazard Ranking Scores provide an estimation of relative hazard rather than a quantitative determination of risk. However, the scores do indicate that additional information should be collected under CEARP to fully evaluate potential risks to the public and the environment. The initial ranking of individual sites at the plant indicates that priority attention should be given to the solar evaporation ponds, VOC-contamination of the groundwater, and the present landfill. Rocky Flats Plant personnel are already involved in actions to reduce potential hazards from these sites and further characterize the VOC contamination plume In addition, remedial investigation studies will be conducted during CEARP Phase II.

Table B 1 Hazard Ranking Summary

Site	Total Migration Mode		Direct Contact Score		Fire/ Explosion Score	
	Chem	Rad	Chem	Rad	Chem	Rad
Aggregated						
Walnut Creek	53	9	17	0	0	0
Woman Creek	40	6	0	0	0	0
Individual Sites						
Solar Evaporation Ponds	46	7	17	0	0	0
VOC in Groundwater	40	NA[a]	0	NA	0	NA
Present Landfill	34	5	0	0	0	0
903 Drum Storage Area	26	1	0	0	0	0
Radioactive Site 800 Area	20	0	0	0	0	0
Trenches T-1 to T-11	17	6	0	0	0	0
Reactive Metal Destruction Site	16	NA	0	NA	0	NA
Original Landfill	15	5	0	0	0	0
Cooling Tower Blowdown Ponds	12	NE[b]	0	NE	0	NE
Oil Sludge Disposal	9	NA	0	NA	0	NA
Lithium Metal Destruction Site	8	NA	0	NA	0	NA

[a] Not applicable

[b] Not evaluated

Additional data will also be collected during CEARP Phase IIA field reconnaissance activities from sites with insufficient information for HRS/MHRS scoring. The site characterization data will be used to score these sites, and the data and scores will be published as supplements to the CEARP Phase I report.

B.III. Hazard Ranking System/Modified Hazard Ranking System Score Sheets.

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Aggregated Walnut Creek

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Rea/Margi Hertz, LANL DATE: April 1986

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

This evaluation represents an aggregation of those sites at Rocky Flats Plant that fall within the surface drainage of Walnut Creek (both the north and south branches). This aggregation seems reasonable because Great Western Reservoir is the common receptor. It includes the solar evaporation ponds, VOC in groundwater, and present landfill.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
S_M =	33.05	8.79	33.05
S_{gw} =	44.98	12.97	44.98
S_{sw} =	00.00	9.23	00.00
S_a =	0.00	0.00	0.00
S_{fe} =	0.00	0.00	0.00
S_{dx} =	16.67	0.00	16.67

GROUNDWATER ROUTE WORKSHEET Site: Aggregated Walnut Creek

RATING FACTOR	VALUE-RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	3 1	Nitrates and tritium found in water seepage in Artesian north of solar ponds (Dunn 1973, Interviews 1986) (Solar Evap Ponds)
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3 2	
A Depth to Aquifer of Concern	0 1 2 3	ME	2	0	6		
B Net Precipitation	0 1 2 3	ME	1	0	3		
C Permeability of the Unsaturated Zone	0 1 2 3	ME	1	0	3		
D Physical State	0 1 2 3	ME	1	0	3		
TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3 CONTAINMENT	0 1 2 3	ME	1	0	3	3 3	
4 WASTE CHARACTERISTICS						3 4	
Chemical							Four VOCs detected in groundwater (trichloroethylene; tetrachloroethylene; 1,1 dichloroethylene; 1 1,1 trichloroethane (PE 1986)) Toxicity 3 (Ba): persistence 3. Volume unknown. Worst case assumed. (VOC in Groundwater)
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		
Radioactive							Total uranium 156 pCi/l; Tritium 20,000 pCi/l, these are the highest values measured in wells (Solar Evap Ponds) Insufficient data for analysis.
A Maximum Observed	0 1 3 7 11 15 21 26	7	1	7	26		
B Maximum Potential	0 1 3 7 11 15 21 26	ME	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				26	26		
RADIOACTIVE				7	26		
5 TARGETS						3 5	
A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available Distance to nearest well 2000 ft to 1 mile About 50 rural wells within 3 miles; population served assumed at 100 (3 8 people per well) (VOC in Groundwater)
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 26 30 32 35 40	16	1	16	40		
TOTAL TARGETS SCORE				22	49		
6. CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				25740	57330		
RADIOACTIVE				6930	57330		
7 NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Dgw =				44.90	100.00		NOTE: ME means Not Evaluated.
RADIOACTIVE Dgw =				12.09	100.00		
MAXIMUM Dgw =				44.90	100.00		

D044716

SURFACE WATER ROUTE WORKSHEET Site: Aggregated Walnut Creek

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF. SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	4.1	Nitrates and tritium found in water seepage in hillside north of ponds (Dames & Moore Report, p. 20, Lawrence Report, Fig 14, and Interviews 1986) (Solar Evap. Ponds)
	If Observed Release is Given a Value of 45, Proceed to Line 4							
	If Observed Release is Given a Value of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						4.2	
	A Facility Slope and Intervening Terrain	0 1 2 3	ME	1	0	3		
	B 1 yr 24 hr Rainfall	0 1 2 3	ME	1	0	3		
	C Distance to Nearest Surface Water	0 1 2 3	ME	2	0	6		
	D Physical State	0 1 2 3	ME	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	ME	1	0	3	4.3	
4	WASTE CHARACTERISTICS						4.4	
	Chemical							Four VOCs detected in Groundwater (trichloroethylene; tetrachloroethylene; 1,1 dichloroethylene; 1,1,1 trichloroethane (PC 1988)) Toxicity 3 (Max); Persistence 3 Volume unknown. Worst case considered. (VOC in Groundwater)
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		
	B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26	3	1	3	26		1,100 pCi/l U3; 21 pCi/l U; 0.12 pCi/l Pu; 0.18 pCi/l Am (ADAH 1988 DA) (Solar Evap. Ponds)
	B Maximum Potential	0 1 3 7 11 15 21 26	0	1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				26	26		
	RADIOACTIVE				3	26		
5	TARGETS						4.5	
	A Surface Water Use	0 1 2 3	3	3	9	9		Great Western Reservoir municipal water supply for Broomfield. No sensitive environments in area (DPEIS 1980) Distance to reservoir 2000 ft to 1 mile; population served over 10,000 (VOC in Groundwater)
	B. Distance to Sensitive Environment	0 1 2 3	0	2	0	6		
	C Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 28 32 36 40	35	1	35	40		
	TOTAL TARGETS SCORE				44	55		
6	CALCULATIONS							
	If Line 1 is 45, Multiply 1 x 4 x 5					64350		
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				51408			
	RADIOACTIVE				3960			
7	NORMALIZATION							
	Divide Line 6 by 64350 and Multiply by 100							
	CHEMICAL Max =				80.00	100.00		NOTE: ME means Not Evaluated.
	RADIOACTIVE Max =				9.23	100.00		
	MAXIMUM Max =				80.00	100.00		

D044717

AIR ROUTE WORK SHEET — Site: Aggregated Walnut Creek

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	5 1	No observed release; therefore, entire air route score is zero (SEE IN Groundwater)
Date and Locations Sampling Protocol:							
If Line 1 is 0, the So = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2							
2 WASTE CHARACTERISTICS						5 2	
Chemical							
A Reactivity and Incompatibility	0 1 2 3	HE	1	0	3		
B Toxicity	0 1 2 3	HE	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	HE	1	0	8		
Radioactive	0 2 5 8 12 16 20HE		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	HE	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	HE	2	0	6		
C Land Use	0 1 2 3	HE	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL So =				0 00	100 00		NOTE: HE means Not Evaluated.
RADIOACTIVE So =				0 00	100 00		
MAXIMUM So =				0 00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	44 99	12 99	
Surface Water Route	(Ssw)	00 00	9 25	
Air Route	(Sa)	0 00	0 00	
Sum of Squares		2415 00	251.32	
Square Root of Sum		91.76	15 21	
TOTAL MIGRATION SCORE	(Sm)	53.48	8.79	Square Root of Sum Divided by 1.73

DIRECT CONTACT WORKSHEET Site: Aggregated Walnut Creek

RATING FACTOR	VALUE RANGE	SEL VAL	WGHTI FLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury (Solar Evap Ponds)
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guard, but no barrier around ponds (Solar Evap Ponds)
3 CONTAINMENT	0 15	15	1	15	15	8.3	Open ponds (Solar Evap Ponds)
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	3	5	15	15	8.4	Pond A electroplating and electrowetting wastes used for analysis Toxicity of 3, Persistence of 3 Assumed 100 000 pCi/l alpha maximum activity (Solar Evap. Ponds)
Radioactive	0 1 2 4 6 9 12 15	0	1	0	15		
5 TARGETS							
A Population within a 1 mile Radius	0 1 2 3 4 5 ...	4	4	16	20	8.5	Approximately 7 000 employees onsite within one mile. (Solar Evap. Ponds)
B Distance to a Critical Habitat	0 1 2 3	0	4	0	12		No critical habitat within one mile. (Solar Evap. Ponds)
TOTAL TARGETS SCORE				16	32		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				3600	21600		
RADIOACTIVE				0	21600		
7 NORMALIZATION							
Divide Line 6 by 21600 and Multiply by 100							
CHEMICAL Subs =				16.67	100.00		NOTE: NE Score Not Evaluated.
RADIOACTIVE Subs =				0.00	100.00		
MAXIMUM Subs =				16.67	100.00		

FIRE AND EXPLOSION WORKSHEET Site: Aggregated Walnut Creek

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore, entire score is zero (Solar Evap Ponds)
2 WASTE CHARACTERISTICS						7.2	
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7.3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F. Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5. NORMALIZATION							
Divide Line 4 by 1440 and Multiply by 100							
CHEMICAL Site =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Site =				0.00	100.00		
MAXIMUM Site =				0.00	100.00		

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Aggregated Woman Creek

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Bechtel International Operator

NAME OF REVIEWER: Ken Dos/Margit Harris, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility contamination route of major concern; types of information needed for rating; agency action, etc.)

This evaluation represents an aggregation of those sites at Rocky Flats Plant that fall within the surface drainage of Woman Creek. This aggregation seems reasonable because Standley Lake is the common receptor it includes the VOC in groundwater, the 903 drum storage area, the original landfill, trenches T-1 to T-11, reactive metal destruction site, oil studge disposal, cooling tower blowdown ponds and titanium metal destruction site.

SCORES:	CHEMICAL	RADIOACTIVE	MIGRATION
Sm =	39.48	9.73	39.48
Sgw =	36.73	9.89	36.73
Ssw =	18.18	0.70	18.18
Sa =	99.38	0.00	99.38
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

GROUNDWATER ROUTE WORKSHEET Site: Aggregated Woman Creek

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3 1	VOC detected in groundwater unpublished 1985 data (PC 19884) (VOC in Groundwater)
	If Observed Release is Given a Score of 45, Proceed to Line 4							
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3 2	
	A Depth to Aquifer of Concern	0 1 2 3	NE	2	0	6		
	B Net Precipitation	0 1 2 3	NE	1	0	3		
	C Permeability of the Unsaturated Zone	0 1 2 3	NE	1	0	3		
	D Physical State	0 1 2 3	NE	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	NE	1	0	3	3 3	
4	WASTE CHARACTERISTICS						3.4	
	Chemical							Four VOCs detected in groundwater (trichloroethylene; tetrachloroethylene; 1,1 dichloroethylene; 1,1,1 trichloroethane (PC 19888)) Toxicity 3 (Ben); Persistence assumed 3 Volume unknown. Worst case assumed. (VOC in Groundwater)
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		
	B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26	7	1	7	26		156 pCi/l uranium in well (RFEIS 1980). (Original Landfill)
	B Maximum Potential	0 1 3 7 11 15 21 26	1	1	1	26		Assume total 11 Ci plutonium (RFEIS 1980). (903 Drum Storage Area)
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				26	26		
	RADIOACTIVE				7	26		
5	TARGETS						3 5	
	A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available Distance to nearest well 1 to 2 miles
	B. Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 28 32 36 40	12	1	12	40		About 50 rural wells within 3 miles; population served assumed at 190 (3 8 people per well). (903 Drum Storage Area)
	TOTAL TARGETS SCORE				18	49		
6	CALCULATIONS							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				21060	57330		
	RADIOACTIVE				3670	57330		
7	NORMALIZATION							
	Divide Line 6 by 57330 and Multiply by 100							
	CHEMICAL Sgw =				36 73	100 00		NOTE: NE means Not Evaluated.
	RADIOACTIVE Sgw =				6 40	100.00		
	MAXIMUM Sgw =				36.73	100.00		

D044722

SURFACE WATER ROUTE WORKSHEET Site: Aggregated Woman Creek

RATING FACTOR	VALUE RANGE	SEL VAL	REL MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0	45	1	45	45	4.1	Plutonium detected in surface water (ASMR 1984) (903 903 Drum Storage Area)
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A. Facility Slope and Intervening Terrain	0 1 2 3	NE	1	0	3		
B 1 yr 24 hr Rainfall	0 1 2 3	NE	1	0	3		
C Distance to Nearest Surface Water	0 1 2 3	NE	2	0	6		
D Physical State	0 1 2 3	NE	1	0	3		
TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3 CONTAINMENT	0 1 2 3	NE	1	0	3	4.3	
4 WASTE CHARACTERISTICS						4.4	
Chemical							Four VOCs detected in groundwater (trichloroethylene; tetrachloroethylene; 1,1-dichloroethylene; 1,1,1 trichloroethane (MK 1988)) Toxicity 3 (Max); Persistence assumed 3. Volume unknown. Worst case assumed. (VOC in Groundwater)
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	1	1	1	26		0.4 pCi/l in Woman Creek - represents natural background levels (ASMR 1982 1984). (Original landfill) Assume total 11 Ci plutonium (EPEIS 1980) Stream flow is about 1 x 10+9 liters per year (Burr 1976) Plus 44 pounds depleted uranium. (903 Drum Storage Area)
B Maximum Potential	0 1 3 7 11 15 21 26	1	1	1	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				26	26		
RADIOACTIVE				1	26		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	3	3	6	9		Surface water within 3 miles used for livestock no sensitive environments in the area (EPEIS 1980). Distance to surface water intake downstream 2 to 3 miles; assumed population between 1 and 100 people This is the assumed population at risk from utilizing the livestock (30 cows times 1.3 people per cow) (903 Drum Storage Area)
B Distance to Sensitive Environment	0 1 2 3	0	2	0	6		
C. Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 38 40	4	1	4	40		
TOTAL TARGETS SCORE				10	55		
6 CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				11700			
RADIOACTIVE				450			
7. NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Row =				18.18	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Row =				0.70	100.00		
MAXIMUM Row =				18.18	100.00		

AIR ROUTE WORK SHEET

Site: Aggregated Woman Creek

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	5 1	Observed release (RFEIS 1989) (903 Drum Storage Area)
Date and Location:	see RFEIS 1989						
Sampling Protocol:	see RFEIS 1989						
If Line 1 is 0, the Sa = 0 Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2							
2 WASTE CHARACTERISTICS						5 2	
Checklist							
A Reactivity and Incompatibility	0 1 2 3	1	1	1	3		Material present but does not pose a hazard (40CFR300 App. A, p. 48) (903 Drum Storage Area)
B Toxicity	0 1 2 3	3	3	9	9		Assumed toxicity 3 (903 Drum Storage Area)
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		Assumed maximum. (VOC in Groundwater)
Radioactive	0 2 5 8 12 16 20	0	1	0	20		Annual air release 1 x 10 3 to small for a RARS score (ASRS 1982 1986) (903 Drum Storage Area)
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				18	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	21	1	21	30		Population (workforce) within 1 mi between 3 001 and 10 000 people (ASRS 1986). (903 Drum Storage Area)
B. Distance to Sensitive Environment	0 1 2 3	0	2	0	6		No sensitive environments in area (RFEIS 1989) (903 Drum Storage Area)
C. Land Use	0 1 2 3	3	1	3	3		Distance to nearest industrial area < 0 25 miles (903 Drum Storage Area)
TOTAL TARGETS SCORE				24	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				19440	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				55 38	100 00		NOTE: NE waste not Evaluated.
RADIOACTIVE Sa =				0 00	100 00		
MAXIMUM Sa =				55 38	100 00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE
Groundwater Route	(Sgw)	36 75	9 89
Surface Water Route	(Ssw)	18 16	0 70
Air Route	(Sa)	55 38	0 00
Sum of Squares		4767 47	98 38
Square Root of Sum		69 00	9 91
TOTAL MIGRATION SCORE	(Sm)	39 65	5 73

Square Root of Sum Divided by 1 73

DIRECT CONTACT WORKSHEET — Site: Aggregated Woman Creek

RATING FACTOR	VALUE-RANGE--	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury. (903 Drum Storage Area)
If Observed Incidence is given a Score of 45, Proceed to Line 4							
If Observed Incidence is given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3		1	1	3	8.2	Security guard; adequate surface cover (903 Drum Storage Area)
3 CONTAINMENT	0 15	0	1	0	15	8.3	Adequate surface cover. (903 Drum Storage Area)
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	ME	5	0	15	8.4	
Radioactive	0 1 2 4 6 9 12 15	ME	1	0	15		
5 TARGETS							
A Population Within a 1 Mile Radius	0 1 2 3 4 5	ME	4	0	20	8.5	
B Distance to a Critical Habitat	0 1 2 3	ME	4	0	12		
TOTAL TARGETS SCORE				0	32		

6. CALCULATION

If Line 1 is 45, Multiply 1 x 4 x 5
If Line 1 is 0, Multiply 2 x 3 x 4 x 5

CHEMICAL	0	21600
RADIOACTIVE	0	21600

7 NORMALIZATION

Divide Line 6 by 21600 and Multiply by 100

CHEMICAL Sdr =	0.00	100.00
RADIOACTIVE Sdr =	0.00	100.00
MAXIMUM Sdr =	0.00	100.00

NOTE: ME means Not Evaluated.

FIRE AND EXPLOSION WORKSHEET Site: Aggregated Woman Creek

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore, entire score is zero (903 Drum Storage Area)
2 WASTE CHARACTERISTICS						7.2	
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7.3	
A Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E. Population within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4. CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION							
Divide Line 4 by 1440 and multiply by 100							
CHEMICAL Site =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Site =				0.00	100.00		
NUMERICAL Site =				0.00	100.00		

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Solar Evaporation Ponds

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Rea/Margi Hertz, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:
(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Solar evaporation ponds A, B, and C. Combined total capacity of 60 $4x10^6$ liters. Surface excavations with raised berms. Lined with clay, asphalt-cement, and PVC. Have leaked. Contain a wide variety of wastes including sewage sludge, nitrates, americium, plutonium, uranium, and tritium.

Maximum radionuclide concentration in pCi/l: 241 Am at 2 700; 239 Pu at 2,000; Total U at 14,000; and 3H at 6460. Recent data (Sept 1986) is used for tritium to reflect the decay of this isotope, other data from EIS.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
S_M =	46.16	7.42	46.16
S_{gw} =	36.73	0.89	36.73
S_{sw} =	70.91	8.16	70.91
S_a =	0.00	0.00	0.00
S_{fe} =	0.00	0.00	0.00
S_{dx} =	16.67	0.00	16.67

SURFACE WATER ROUTE WORKSHEET Site: Solar Evaporation Ponds

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	4.1	Nitrates and tritium found in water seepage in hillside north of ponds (Dunn & Stevens Report, p 20; Lambirth Report, Fig 14, and interviews 1986). This scoring reflects guidance from page 29 HRS Users Manual
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	(EPA 1986)
A Facility Slope and Intervening Terrain	0 1 2 3	MI	1	0	3		
B 1 yr 24 hr. Rainfall	0 1 2 3	MI	1	0	3		
C Distance to Nearest Surface Water	0 1 2 3	MI	2	0	6		
D Physical State	0 1 2 3	MI	1	0	3		
TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3 CONTAINMENT	0 1 2 3	MI	1	0	3	4.3	
4 WASTE CHARACTERISTICS						4.4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		High nitrates; possible chromates and heavy metals; assumed worst case (Toxicity 3, Persistence 3)
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		Assumed one fill volume of pond (over 10,000 drums) This scoring reflects guidance from page 36 HRS Users Manual (EPA 1986) and RITES Training course.
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	3	1	3	26		1100 pCi/L Ra; 21 pCi/L U; 0.12 pCi/L Pu; 0.18 pCi/L Am (ADHS 1982-1984).
B Maximum Potential	0 1 3 7 11 15 21 26	0	1	0	26		Assumed total release to B Walnut Creek: 60 & 8.4 E+6 L, 14 000 pCi/L U; 2,000 pCi/L Pu; annual flow 6.1 E+8 (EPEIS 1980). This method was used because it is a realistic worst case and the HRS formula on page C 7 Draft HRS Users Manual is for solid waste (Phone communication with PEL; March 28, 1986).
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				26	26		
RADIOACTIVE				3	26		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	3	3	9	9		Great Western Reservoir municipal water supply for Broomfield. No sensitive environments in area (EPEIS 1980). Distance to reservoir 1 to 2 miles; population served over 10 000. This scoring reflects guidance from page 36 to 39 HRS Users Manual (EPA 1986)
B Distance to Sensitive Environment	0 1 2 3	0	2	0	6		
C Population Served/ Distance to Water	0 4 6 8 10 12 16 18 20 24 30 32 35 40	30	1	30	40		
TOTAL TARGETS SCORE				39	55		
6 CALCULATION					64350		
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				43680			
RADIOACTIVE				5265			
7 NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							NOTE: MS score not Evaluated.
CHEMICAL Sco =				70.91	100.00		
RADIOACTIVE Sco =				8.18	100.00		
MAXIMUM Sco =				70.91	100.00		

DIRECT CONTACT WORKSHEET Site: Solar Evaporation Ponds

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of documented contamination or injury
	If Observed Incident is Given a Score of 45, Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guard, but no barrier around ponds
3	CONTAINMENT	0 15	15	1	15	15	8.3	Open ponds.
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	3	5	15	15	8.4	Toxicity of 3, persistence of 3.
	Radioactive	0 1 2 4 6 9 12 15	0	1	0	15		Used maximum observed levels (EPRI 1989)
5	TARGETS							
	A Population Within a 1 Mile Radius	0 1 2 3 4 5	4	4	16	20	8.5	Approximately 7,000 workers onsite within one mile
	B Distance to a Critical Habitat	0 1 2 3	0	4	0	12		No critical habitat within one mile.
	TOTAL TARGETS SCORE				16	32		The scoring on this worksheet reflects guidance from pages 57 to 60 HRS Users Manual (EPA 1984).
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5			CHEMICAL	3600	21600		
				RADIOACTIVE	0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100			CHEMICAL Sds =	16.67	100.00		NOTE: All scores are Evaluated.
				RADIOACTIVE Sds =	0.00	100.00		
				MAXIMUM Sds =	16.67	100.00		

FIRE AND EXPLOSION WORKSHEET Site: Solar Evaporation Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore, entire score is zero. This score reflects guidance from page 49 HRS Users
2 WASTE CHARACTERISTICS						7.2	Manual (EPA 1986).
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7.3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 mile Radius	0 1 2 3 4 5	NE	1	0	5		
F. Buildings Within 2 mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION							
Divide Line 4 by 1440 and Multiply by 100							
CHEMICAL S% =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE S% =				0.00	100.00		
MAXIMUM S% =				0.00	100.00		

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: VOC in Groundwater

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Sco/Marll Marts, LANL DATE: April 1986

GENERAL DESCRIPTION OF THE FACILITY
(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

VOC has been detected in the surficial aquifer at Rocky Flats Plant.
To evaluate this site, toxicity, persistence, and quantities were maximized.
This approach will give a very conservative HRS score for this site.
Contamination was assumed to extend to the nearest surface water drainage,
and assumed potential groundwater discharge to surface water.

SCORES:

	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	40.38	0.00	40.38
Sgw =	44.90	0.00	44.90
Ssw =	53.38	0.00	53.38
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

GROUNDWATER ROUTE WORKSHEET Site: VOC in Groundwater

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF. SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3 1	Four VOCs detected in groundwater (trichloroethylene tetrachloroethylene; 1,1 dichloroethylene 1,1,1 trichloroethane (EPC 1988)) This score reflects guidance from page 9 HRS Users Manual (EPA 1984).
	If Observed Release is Given a Score of 45, Proceed to Line 4							
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3 2	
	A Depth to Aquifer of Concern	0 1 2 3	MI	2	0	6		
	B Net Precipitation	0 1 2 3	MI	1	0	3		
	C Permeability of the Unsaturated Zone	0 1 2 3	MI	1	0	3		
	D Physical State	0 1 2 3	MI	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	MI	1	0	3	3 3	
4	WASTE CHARACTERISTICS						3 4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Toxicity 3 (Max); Persistence assumed 3.
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	0	1	0	0		Volume unknown. Worst case assumed. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1984).
	Radioactive							
	A. Maximum Observed	0 1 3 7 11 15 21 26	MI	1	0	26		
	B Maximum Potential	0 1 3 7 11 15 21 26	MI	1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				26	26		
	RADIOACTIVE				0	26		
5	TARGETS						3 5	
	A Groundwater Use	0 1 2 3	3	2	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 2000 ft to 1 mile About 30 rural wells within 3 miles; population served assumed at 100 (3.3 people per well) This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1984).
	B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	16	1	16	40		
	TOTAL TARGETS SCORE				22	49		
6.	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				25740	57330		
	RADIOACTIVE				0	57330		
7	NORMALIZATION							
	Divide Line 6 by 57330 and Multiply by 100							
	CHEMICAL Sgw =				44.90	100.00		NOTE: MI means Not Evaluated.
	RADIOACTIVE Sgw =				0.00	100.00		
	maximum Sgw =				44.90	100.00		

SURFACE WATER ROUTE WORKSHEET Site: VOC in Groundwater

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SRC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release This score reflects guidance from page 29 HRS Users Manual (EPA 1986)
	If Observed Release is given a Value of 45, Proceed to Line 4							
	If Observed Release is given a Value of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						4.2	
	A Facility Slope and Intervening Terrain	0 1 2 3	0	1	0	3		No surface runoff (subsurface site) HRS not designed for subsurface sites; page 29 HRS Users Manual (EPA 1986) 24 hr rainfall 1.2 in (Fig 8, ADCP1300 App A) North Walnut Creek about 700 ft away This scoring reflects guidance from page 32 HRS Users Manual (EPA 1986). Reservoir is a liquid.
	B 1 yr 24 hr Rainfall	0 1 2 3	1	1	1	3		
	C Distance to Nearest Surface Water	0 1 2 3	3	2	6	6		
	D Physical State	0 1 2 3	3	1	3	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				10	15		
3	CONTAINMENT	0 1 2 3	3	1	3	3	4.3	Assumed worst case. HRS not designed for subsurface sites; page 34 HRS Users Manual (EPA 1986)
4	WASTE CHARACTERISTICS						4.4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Toxicity 3 (Benz); Persistence assumed 3. Volume unknown. Worst case assumed. This scoring reflects guidance from page 34 HRS Users Manual (EPA 1986).
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	8	1	8	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26 HR		1	0	26		
	B. Maximum Potential	0 1 3 7 11 15 21 26 HR		1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				26	26		
	RADIOACTIVE				0	26		
5	TARGETS						4.5	
	A Surface Water Use	0 1 2 3	3	3	9	9		Great Western Reservoir municipal water supply for Broomfield. No sensitive environments in area (EPRIS 1988) Distance to reservoir 2000 ft to 1 mile; population served over 10,000 This scoring reflects guidance from pages 36 to 38 HRS Users Manual (EPA 1986)
	B Distance to Sensitive Environment	0 1 2 3	0	2	0	6		
	C Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 35 40	35	1	35	40		
	TOTAL TARGETS SCORE				44	55		
6.	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5					64350		
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				34320			
	RADIOACTIVE				0			
7.	NORMALIZATION							
	Divide Line 6 by 64350 and Multiply by 100							
	CHEMICAL Sw =				53.33	100.00		NOTE: All sources Not Evaluated.
	RADIOACTIVE Sw =				0.00	100.00		
	MAXIMUM Sw =				53.33	100.00		

AIR ROUTE WORK SHEET Site: VOC in Groundwater

RATING FACTOR		VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE		0 45	0	1	0	45	S 1	No observed release; therefore, entire air route is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Locations Sampling Protocol:								
If Line 1 is 0, the Sa = 0. Enter on Line 5								
If Line 1 is 45, Then Proceed to Line 2								
2 WASTE CHARACTERISTICS							S 2	
Chemical								
A Reactivity and Incompatibility		0 1 2 3	ME	1	0	3		
B Toxicity		0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity		0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive		0 2 5 8 12 16 20ME		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE	CHEMICAL				0	20		
	RADIOACTIVE				0	20		
3 TARGETS								
A. Population Within 4 Mile Radius		0 9 12 15 18 21 24 27 30	ME	1	0	30		
B. Distance to Sensitive Environment		0 1 2 3	ME	2	0	6		
C. Land Use		0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE					0	39		
4 CALCULATION								
Multiply 1 x 2 x 3	CHEMICAL				0	35100		
	RADIOACTIVE				0	35100		
5 NORMALIZATION								
Divide Line 4 by 35100 and Multiply by 100	CHEMICAL Sa =				0.00	100.00		NOTE: ME means Not Evaluated.
	RADIOACTIVE Sa =				0.00	100.00		
	MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	44.90	0.00	
Surface Water Route	(Ssw)	33.33	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		4088.27	0.00	
Square Root of Sum		63.72	0.00	
TOTAL MIGRATION SCORE	(Sm)	40.39	0.00	Square Root of Sum Divided by 1.73

DIRECT CONTACT WORKSHEET Site: VOC in Groundwater

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	NE	1	0	45	8.1	No potential; therefore, entire score is zero. This score reflects guidance from page 57 HRS Users Manual (EPA 1986)
	If Observed Incident is Given a Score of 45, Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	NE	1	0	3	8.2	
3	CONTAINMENT	0 15	NE	1	0	15	8.3	
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	NE	5	0	15	8.4	
	Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5.	TARGETS							
	A. Population Within a 1 mile Radius	0 1 2 3 4 5	NE	4	0	20	8.5	
	B. Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6	CALCULATIONS							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
			CHEMICAL		0	21600		
			RADIOACTIVE		0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100							
			CHEMICAL Sdo =		0.00	100.00		NOTE: NE means Not Evaluated.
			RADIOACTIVE Sdo =		0.00	100.00		
			MARINAS Sdo =		0.00	100.00		

FIRE AND EXPLOSION WORKSHEET Site: VOC in Groundwater

	RATING FACTOR	VALUE RANGE	REL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore, entire score is zero. This score reflects guidance from page 49 HRS Users Manual 7.2 (EPA 1986).
2	WASTE CHARACTERISTICS						7.2	
	A Direct Evidence	0 3	NE	1	0	3		
	B. Ignitability	0 1 2 3	NE	1	0	3		
	C Reactivity	0 1 2 3	NE	1	0	3		
	D Incompatibility	0 1 2 3	NE	1	0	3		
	E Waste Quantity							
	Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
	Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				0	20		
	RADIOACTIVE				0	20		
3	TARGETS						7.3	
	A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
	B Distance to Nearest Building	0 1 2 3	NE	1	0	3		
	C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
	D. Land Use	0 1 2 3	NE	1	0	3		
	E Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
	F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
	TOTAL TARGETS SCORE				0	24		
4	CALCULATION Multiply 1 x 2 x 3							
	CHEMICAL				0	1440		
	RADIOACTIVE				0	1440		
5	NORMALIZATION Divide Line 4 by 1440 and Multiply by 100							
	CHEMICAL 0% =				0.00	100.00		NOTE: NE means Not Evaluated.
	RADIOACTIVE 0% =				0.00	100.00		
	MAXIMUM 0% =				0.00	100.00		

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Present Landfill

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Rea/Marji Harris, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Placed in service in 1968 and upgraded in 1974. An impervious clay ring was

added around the existing landfill and holding and sampling structures were added

downstream. There is a basal clay formation under the entire landfill.

This landfill received chromates, solvent, several small strontium

calibration sources, and small amounts of organic chemicals.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
S_M =	35.73	4.00	35.73
S_{gw} =	26.84	1.41	26.84
S_{sw} =	51.00	0.10	51.00
S_a =	0.00	0.00	0.00
S_{fe} =	0.00	0.00	0.00
S_{dc} =	0.00	0.00	0.00

D044739

GROUNDWATER ROUTE WORKSHEET Site: Present Landfill

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3.1	Tritium and strontium observed in leachate pond in mid 1970s (EPEIS 1980, Interview 1986). This score reflects guidance from page 9 HRS Users Manual (EPA 1986)
	If Observed Release is Given a Score of 45, Proceed to Line 4							
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3.2	
	A Depth to Aquifer of Concern	0 1 2 3	NE	2	0	6		
	B Net Precipitation	0 1 2 3	NE	1	0	3		
	C Permeability of the Unsaturated Zone	0 1 2 3	NE	1	0	3		
	D. Physical State	0 1 2 3	NE	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	NE	1	0	3	3.3	
4	WASTE CHARACTERISTICS						3.4	
	Chemical							
	A. Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed some heavy metals; toxicity 3; persistence 3
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		About 1000 kg sanitary sewage sludge disposed 1968 1970 (EPEIS 1980 p 2 288; Dunn 1973). Quantity 1 to 40 drums. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986).
	Radioactive							
	A. Maximum Observed	0 1 3 7 11 15 21 26	1	1	1	26		630 pCi/l tritium observed adjacent to landfill; landfill across drainage from well with higher values (EPEIS 1980) Insufficient data for maximum potential HRS evaluation.
	B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				19	26		
	RADIOACTIVE				1	26		
5	TARGETS						3.5	
	A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available Nearest well 1 to 2 mi distant About 50 rural wells within 3 miles; population served assumed at 100 (3.8 people per well) This scoring reflects guidance from pages 26 to 27 HRS Users Manual (EPA 1986).
	B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 26 30 32 34 40	12	1	12	40		
	TOTAL TARGETS SCORE				18	49		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				15390	97200		
	RADIOACTIVE				810	97200		
7.	NORMALIZATION							
	Divide Line 6 by 97200 and Multiply by 100							
	CHEMICAL Sgw =				26.85	100.00		NOTE: NE scores not Evaluated.
	RADIOACTIVE Sgw =				1.41	100.00		
	MAXIMUM Sgw =				26.85	100.00		

D044740

SURFACE WATER ROUTE WORKSHEET

Site: Present Landfill

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	4.1	Tritium and strontium observed in leachate pond in mid 1970s (EPEIS 1980, Interviews 1984). This scoring reflects guidance from page 29 HRS Users Manual (EPA 1986).
	If Observed Release is Given a Value of 45, Proceed to Line 4							
	If Observed Release is Given a Value of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						4.2	
	A. Facility Slope and Intervening Terrain	0 1 2 3	NE	1	0	3		
	B 1 yr 24 hr Rainfall	0 1 2 3	NE	1	0	3		
	C Distance to Nearest Surface Water	0 1 2 3	NE	2	0	6		
	D Physical State	0 1 2 3	NE	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	NE	1	0	3	4.3	
4	WASTE CHARACTERISTICS						4.4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed some heavy metals; toxicity 3; persistence 3
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		About 1000 kg sanitary sewage sludge disposed 1968 1970 (EPEIS 1980 p 2 288; Dunn 1979). Quantity 1 to 10 drums. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986).
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26	3	1	3	26		1,100 pCi/l tritium (ARHCO 1982-1984).
	B Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		Insufficient data to evaluate maximum HRS score
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				19	26		
	RADIOACTIVE				3	26		
5	TARGETS						4.5	
	A Surface Water Use	0 1 2 3	3	3	9	9		Great Western Reservoir (municipal water supply) for Broomfield. No sensitive environments in area (EPEIS 1980) Distance to reservoir 1 to 2 miles; population served over 10,000. This scoring reflects guidance from pages 36 to 38 HRS Users Manual (EPA 1986).
	B Distance to Sensitive Environment	0 1 2 3	0	2	0	6		
	C Population Served/ Distance to Water / Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 35 40	30	1	30	40		
	TOTAL TARGETS SCORE				39	55		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5					64350		
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				33345			
	RADIOACTIVE				5265			
7.	NORMALIZATION							
	Divide Line 6 by 64350 and Multiply by 100							
	CHEMICAL Row =				51.82	100.00		NOTE: NE scores not Evaluated.
	RADIOACTIVE Row =				8.18	100.00		
	MAXIMUM Row =				51.82	100.00		

AIR ROUTE WORK SHEET — Site: Present Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF: SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	S 1	No observed release; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986)
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, the Sa = 0 Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						S 2	
Chemical							
A Reactivity and Incompatibility	0 1 2 3	ME	1	0	3		
B. Toxicity	0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive	0 2 5 8 12 16 20ME		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	ME	1	0	30		
B Distance to Sensitive Environment	0 1 2 3	ME	2	0	6		
C Land Use	0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: ME means Not Evaluated
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	26.94	1.41	
Surface Water Route	(Ssw)	51.02	8.18	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		3468.76	65.96	
Square Root of Sum		58.36	8.30	
TOTAL MIGRATION SCORE	(Sm)	33.73	4.88	Square Root of Sum Divided by 1.73

DIRECT CONTACT WORKSHEET Site: Present Landfill

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury
	If Observed Incident is Given a Score of 45, Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guard, covered landfill
3	CONTAINMENT	0 15	0	1	0	15	8.3	Covered landfill. This score of zero gives a direct exposure score of zero at step 6; therefore, the rest of the sheet is not scored. This scoring reflects guidance from pages 57 to 60 HRS Score Manual (EPA 1986).
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	NE	3	0	15	8.4	
	Radioactive	0 1 2 6 9 12 15	NE	1	0	15		
5	TARGETS							
	A. Population Within a 1 Mile Radius	0 1 2 3 4 5	NE	4	0	20	8.5	
	B Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6.	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				0	21600		
	RADIOACTIVE				0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100							
	CHEMICAL Sub =				0.00	100.00		NOTE: NE means Not Evaluated.
	RADIOACTIVE Sub =				0.00	100.00		
	MAXIMUM Sub =				0.00	100.00		

FIRE AND EXPLOSION WORKSHEET Site: Present Landfill

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential; therefore, entire score is zero This score reflects guidance from page 69 HRS Users Manual
2	WASTE CHARACTERISTICS						7 2	(EPA 1986)
	A. Direct Evidence	0 3	HE	1	0	3		
	B Ignitability	0 1 2 3	HE	1	0	3		
	C Reactivity	0 1 2 3	HE	1	0	3		
	D Incompatibility	0 1 2 3	HE	1	0	3		
	E Waste Quantity							
	Chemical	0 1 2 3 4 5 6 7 8	HE	1	0	8		
	Radioactive	0 1 2 3 5 6 8	HE	1	0	8		
	TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				0	20		
	RADIOACTIVE				0	20		
3	TARGETS						7 3	
	A Distance to Nearest Population	0 1 2 3 4 5	HE	1	0	5		
	B Distance to Nearest Building	0 1 2 3	HE	1	0	3		
	C Distance to Sensitive Environment	0 1 2 3	HE	1	0	3		
	D. Land Use	0 1 2 3	HE	1	0	3		
	E Population Within 2 Mile Radius	0 1 2 3 4 5	HE	1	0	5		
	F Buildings Within 2 Mile Radius	0 1 2 3 4 5	HE	1	0	5		
	TOTAL TARGETS SCORE				0	24		
4	CALCULATION Multiply 1 x 2 x 3							
	CHEMICAL				0	1440		
	RADIOACTIVE				0	1440		
5	NORMALIZATION Divide Line 4 by 1440 and Multiply by 100							
	CHEMICAL Sfo =				0.00	100.00		NOTE: HE scores not Evaluated.
	RADIOACTIVE Sfo =				0.00	100.00		
	MAXIMUM Sfo =				0.00	100.00		

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: 903 Drum Storage Area

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner
Rockwell International, Operator

NAME OF REVIEWER: Ken Rea/Margi Harris, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination routes of major concern; types of information needed for rating; agency action, etc.)

This area was used to store drums of spent machine cutting oil. The drums were
removed between 1967 and 1968. Some of the material leaked, and about
11.4 Ci plutonium were released. Of this, about 8.6 Ci remained onsite, of
which 1.7 Ci are under the existing pad (EPEIS 1980, p 2.73).

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
S_M =	26.13	0.91	26.13
S_{GW} =	26.00	1.41	26.00
S_{SW} =	13.29	0.70	13.29
S_A =	33.00	0.00	33.00
S_{FE} =	0.00	0.00	0.00
S_{DP} =	0.00	0.00	0.00

GROUNDWATER ROUTE WORKSHEET Site: 903 Drum Storage Area

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	3.1	Plutonium detected in groundwater (ABB 1986) This score reflects guidance from page 9 HRS Users Manual (EPA 1986).
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3.2	
A Depth to Aquifer of Concern	0 1 2 3	NE	2	0	6		
B Net Precipitation	0 1 2 3	NE	1	0	3		
C Permeability of the Unsaturated Zone	0 1 2 3	NE	1	0	3		
D Physical State	0 1 2 3	NE	1	0	3		
TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3 CONTAINMENT	0 1 2 3	NE	1	0	3	3.3	
4 WASTE CHARACTERISTICS						3.4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed toxicity 3, persistence 3 Assumed 0.5% of the drums (about 28 drums. This site was cleaned. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986) and MITRE training course
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		
Radioactive							
A Maximum Observed	0 1 3 7 11 15 21 26	0	1	0	26		0.19 pCi/l plutonium in wells (ABB 1988) This was the highest value shown in the monitoring reports Used total of 11.4 Ci plutonium (DPSIS 1989).
B Maximum Potential	0 1 3 7 11 15 21 26	1	1	1	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				19	26		
RADIOACTIVE				1	26		
5 TARGETS						3.5	
A Groundwater Use	0 1 2 3	3	3	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 1 to 2 miles About 50 rural wells within 3 miles; population served assumed at 100 (3.0 people per well). This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1986).
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 14 16 18 20 24 26 28 30 32 34 40	12	1	12	40		
TOTAL TARGETS SCORE				18	49		
6 CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				15390	57330		
RADIOACTIVE				810	57330		
7 NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Sys =				26.84	100.00		NOTE: NE score Not Evaluated.
RADIOACTIVE Sys =				1.41	100.00		
MAXIMUM Sys =				26.84	100.00		

D044746

SURFACE WATER ROUTE WORKSHEET Site: 903 Drum Storage Area

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	4.1	Plutonium detected in surface water (ASHR 1982 1984)
	If Observed Release is Given a Value of 45, Proceed to Line 4							This scoring reflects guidance from page 29 HRS Users
	If Observed Release is Given a Value of 0, Proceed to Line 2							Manual (EPA 1986).
2	ROUTE CHARACTERISTICS						4.2	
	A Facility Slope and Intervening Terrain	0 1 2 3	NE	1	0	3		
	B 1 yr 24 hr Rainfall	0 1 2 3	NE	1	0	3		
	C Distance to Nearest Surface Water	0 1 2 3	NE	2	0	6		
	D Physical State	0 1 2 3	NE	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	NE	1	0	3	4.3	
4	WASTE CHARACTERISTICS						4.4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed toxicity 3, persistence 3. Assumed 0.5% of
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		the drums leaked; about 25 drums. This site was cleaned. This scoring reflects guidance from page 34 HRS Users Manual (EPA 1986) and MITRE training course
	Radioactive							
	A. Maximum Observed	0 1 3 7 11 15 21 26	0	1	0	26		0.11 pCi/l plutonium in Woman Creek (ASHR 1984).
	B. Maximum Potential	0 1 3 7 11 15 21 26	1	1	1	26		Assume travel 11.4 Ci plutonium (RFETS 1988) Stream is about 1 x 10+9 liters per year (Hurr 1976)
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				19	26		
	RADIOACTIVE				1	26		
5	TARGETS						4.5	
	A Surface Water Use	0 1 2 3	2	3	6	9		Surface water within 3 mi used for livestock
	B Distance to Sensitive Environment	0 1 2 3	0	2	0	6		No sensitive environments in the area (RFETS 1988)
	C. Population Served/ Distance to Water	0 4 6 8 10 12 16 18 20	4	1	4	40		Distance to surface water intake downstream 2 to 3 miles; assumed population between 1 and 100 people
	Intake Downstream	24 30 32 36 40						This is the assumed population at risk from utilizing the livestock (50 cows times 1.5 people per cow)
	TOTAL TARGETS SCORE				10	99		This scoring reflects guidance from pages 34 to 38 HRS
6.	CALCULATION							Users Manual (EPA 1986).
	If Line 1 is 45, Multiply 1 x 4 x 5					64350		
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				4950			
	RADIOACTIVE				450			
7.	NORMALIZATION							
	Divide Line 6 by 64350 and Multiply by 100							
	CHEMICAL Sum =				13.29	100.00		NOTE: NE score not Evaluated.
	RADIOACTIVE Sum =				0.70	100.00		
	MAXIMUM Sum =				13.29	100.00		

D044747

AIR ROUTE WORK SHEET — Site: 903 Drum Storage Area

RATING FACTOR	VALUE-RANGE	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	3 1	Observed release (RFEIS 1988) This score reflects guidance from page 39 HRS Users Manual (EPA 1986)
Date and Location:	see RFEIS 1988.						
Sampling Protocol:	see RFEIS 1988.						
If Line 1 is 0, then Sa = 0 Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2							
2 WASTE CHARACTERISTICS						3 2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	1	1	1	3		Material present but does not pose a hazard (40CFR300 App. A, p. 469).
B. Toxicity	0 1 2 3	3	3	9	9		Assumed toxicity 3, persistence 3. Assumed 0 92 of the drums contain about 25 drums. This site was cleaned This scoring reflects guidance from page 44 HRS Users Manual (EPA 1986) and RITRE training course
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		
Radioactive	0 2 3 6 12 16 20	0	1	0	20		Air releases 1 x 10-3 annually are too small to result in a score (ASME 1982-1986).
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				11	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	21	1	21	30		Population (workforce) within 1 mile is between 3,001 and 10,000 people (ASME 1986).
B. Distance to Sensitive Environment	0 1 2 3	0	2	0	6		No sensitive environments in area (RFEIS 1988).
C. Land Use	0 1 2 3	3	1	3	3		Distance to nearest industrial area < 0 25 miles The scoring for targets reflects guidance from pages 44 to 46 HRS Users Manual (EPA 1986).
TOTAL TARGETS SCORE				24	30		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				11880	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				33 85	100 00		NOTE: RE score not Evaluated.
RADIOACTIVE Sa =				0 00	100 00		
MAXIMUM Sa =				33 85	100 00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	25 85	1.61	
Surface Water Route	(Ssw)	13.39	0.78	
Air Route	(Sa)	33 85	0 00	
Sum of Squares		2043.73	3.49	
Square Root of Sum		45 20	1 90	
TOTAL MIGRATION SCORE	(Sm)	26.13	0.91	Square Root of Sum Divided by 1.73

D044748

DIRECT CONTACT WORKSHEET Site: 903 Drum Storage Area

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury.
	If Observed Incident is Given a Score of 45, Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guard; adequate surface cover
3	CONTAINMENT	0 15	0	1	0	15	8.3	Adequate surface cover. This score of zero gives a direct contact score of zero at step 6; therefore, the rest of the sheet is not scored. This scoring reflects guidance from pages 37 to 39 HRS Users Manual (EPA 9 4 1986).
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	NE	5	0	15	8 4 1986).	
	Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5	TARGETS							
	A. Population within a 1 Mile Radius	0 1 2 3 4 5+	NE	4	0	20	8.5	
	B. Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6.	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
		CHEMICAL			0	21600		
		RADIOACTIVE			0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100							
		CHEMICAL Sdm =			0.00	100.00		NOTE: NE means Not Evaluated.
		RADIOACTIVE Sdm =			0.00	100.00		
		MAXIMUM Sdm =			0.00	100.00		

D044749

FIRE AND EXPLOSION WORKSHEET Site: 903 Drum Storage Area

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF REC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore entire score is zero. This score reflects guidance from page 49 HRS Users Manual 7.2 (EPA 1984).
2 WASTE CHARACTERISTICS							
A Direct Evidence	0 3	NE	1				
B. Ignitability	0 1 2 3	NE	1	0	3		
C. Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7.3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D. Land Use	0 1 2 3	NE	1	0	3		
E. Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5. NORMALIZATION							
Divide Line 4 by 1440 and multiply by 100							
CHEMICAL Sfc =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sfc =				0.00	100.00		
MARINER Sfc =				0.00	100.00		

D044750

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Radioactive Site 800 Area

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner
Rockwell International, Operator

NAME OF REVIEWER: Ken Ros/Marji Hertz, LANL **DATE:** April 1986

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

An area east of Building 881 was used to dispose of 300 tons of plutonium-contaminated soil (about 7 dpm/g alpha activity) from the Building 776 fire (1969 time frame) and approximately 60 yd of plutonium-contaminated soil (about 250 dpm/g alpha activity) from the Building 774 waste storage tank area. This contamination was covered with approximately 3 ft of soil and fill material (Owen 1973)

SCORES:

	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	20.19	0.00	20.19
Sgw =	32.30	0.00	32.30
Ssw =	13.29	0.00	13.29
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044751

GROUNDWATER ROUTE WORKSHEET Site: Radioactive Site 000 Area

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3.1	Plutonium detected in groundwater (ABRR 1986) This score reflects guidance from page 9 HRS Users Manual (EPA 1986).
	If Observed Release is Given a Score of 45, Proceed to Line 4							
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3.2	
	A Depth to Aquifer of Concern	0 1 2 3	ME	2	0	6		
	B Net Precipitation	0 1 2 3	ME	1	0	3		
	C Permeability of the Unsaturated Zone	0 1 2 3	ME	1	0	3		
	D Physical State	0 1 2 3	ME	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	ME	1	0	3	3.3	
4	WASTE CHARACTERISTICS						3.4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed toxicity 3, persistence 3. Used total quantity of soil buried (300 tons plus 60 yd = 300 tons or yd) This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986) and WIPP training course.
	B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	5	1	5	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26	0	1	0	26		0 19 pCi/l plutonium in wells (ABRR 1982) This was the highest value shown in the monitoring reports Used total of 7 E8x10 3 Ci plutonium. (320 tons at 3 19 pCi/g = 9 13x10 4 Ci; 60 tons at 112 61 pCi/g = 6.12x10 3 pCi/g).
	B Maximum Potential	0 1 3 7 11 15 21 26	0	1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				23	26		
	RADIOACTIVE				0	26		
5	TARGETS						3.5	
	A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available Distance to nearest well 1 to 2 miles About 50 rural wells within 3 miles; population served assumed at 100 (3 0 people per well). This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1986).
	B Distance to Nearest Well/Population Served	0 6 8 8 10 12 16 18 20 24 26 30 32 35 40	12	1	12	40		
	TOTAL TARGETS SCORE				18	49		
6	CALCULATIONS							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				18630	57330		
	RADIOACTIVE				0	57330		
7	NORMALIZATION							
	Divide Line 6 by 57330 and Multiply by 100							
	CHEMICAL Sum =				32 50	100 00		NOTE: ME means Not Evaluated.
	RADIOACTIVE Sum =				0 00	100.00		
	MAXIMUM Sum =				32.50	100.00		

SURFACE WATER ROUTE WORKSHEET Site: Radioactive Site 000 Area

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF. SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	45	1	45	45	4.1	Plutonium detected in surface water (ADHS 1982 1984). This scoring reflects guidance from page 29 HRS Users Manual (EPA 1984)
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A Facility Slope and Intervening Terrain	0 1 2 3	NE	1	0	3		
B. 1 yr. 24 hr Rainfall	0 1 2 3	NE	1	0	3		
C Distance to Nearest Surface Water	0 1 2 3	NE	2	0	6		
D Physical State	0 1 2 3	NE	1	0	3		
TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3 CONTAINMENT	0 1 2 3	NE	1	0	3	4.3	
4 WASTE CHARACTERISTICS						4.4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed toxicity 3, persistence 3. Used total quantity of soil buried (300 tons plus 40 yd = 300 tons or yd). This scoring reflects guidance from page 34 HRS Users Manual (EPA 1984) and MITRE training course.
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		
Radioactive							
A Maximum Observed	0 1 3 7 11 19 21 26	0	1	0	26		0.11 pCi/l plutonium in Woman Creek (ADHS 1984)
B. Maximum Potential	0 1 3 7 11 19 21 26	0	1	0	26		Used total of 7.8x10-3 Ci plutonium. (300 tons at 3.19 pCi/g = 0.73x10-6 Ci; 40 tons at 112.87 pCi/g = 4.52x10-3 pCi/g). Stream flow is about 1x10+9 liters per year (Burr 1979).
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				19	26		
RADIOACTIVE				0	26		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	3	3	6	9		Surface water within 3 mi. used for livestock.
B. Distance to Sensitive Environment	0 1 2 3	0	2	0	6		No sensitive environments in the area (DPEIS 1980). Distance to surface water (intake downstream 2 to 3 miles); assumed population between 1 and 100 people. This is the assumed population at risk from utilizing the livestock (30 cows times 1.5 people per cow). This scoring reflects guidance from pages 36 to 38 HRS Users Manual (EPA 1984).
C. Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 30 32 35 40	4	1	4	40		
TOTAL TARGETS SCORE				10	39		
6. CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				6500			
RADIOACTIVE				0			
7. NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sum =				13.39	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sum =				0.00	100.00		
MAXIMUM Sum =				13.39	100.00		

D044753

AIR ROUTE WORK SHEET

Site: Radioactive Site 000 Area

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	S 1	No observed air release from this site. This score of zero gives a zero score for the entire air route. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, then Sa = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						S 2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	NE	1	0	3		
B. Toxicity	0 1 2 3	NE	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 2 3 6 12 16 20NE		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	NE	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C Land Use	0 1 2 3	NE	1	0	3		
TOTAL TARGETS SCORE				0	30		
4. CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: NE scores not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Score	(Sgw)	32.50	0.00	
Surface Water Score	(Ssw)	13.29	0.00	
Air Score	(Sa)	0.00	0.00	
Sum of Squares		1228.58	0.00	
Square Root of Sum		35.11	0.00	
TOTAL MIGRATION SCORE	(Sm)	20.20	0.00	Square Root of Sum Divided by 1.73

D044754

DIRECT CONTACT WORKSHEET Site: Radioactive Site 000 Area

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED INCIDENT	0 45	0	1	0	45	S 1	No observed incident of personnel contamination or injury
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3		1	1	3	S 2	Security guards adequate surface cover.
3 CONTAINMENT	0 15	0	1	0	15	S 3	Adequate surface cover. This score of zero gives a direct contact score of zero at step 6; therefore, the rest of the sheet is not scored. This scoring reflects guidance from pages 57 to 59 HRS Users Manual (EPA 1986).
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	NE	5	0	15	S 4	1986).
Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5. TARGETS							
A. Population Within a 1 Mile Radius	0 1 2 3 4 5	NE	4	0	20	S 5	
B. Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
TOTAL TARGETS SCORE				0	32		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0	21600		
RADIOACTIVE				0	21600		
7 NORMALIZATION							
Divide Line 6 by 21600 and Multiply by 100							
CHEMICAL Sub =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sub =				0.00	100.00		
MAXIMUM Sub =				0.00	100.00		

D044755

FIRE AND EXPLOSION WORKSHEET Site: Radioactive Site 000 Area

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential therefore, entire score is zero This score reflects guidance from page 49 HRS Users Manual
2 WASTE CHARACTERISTICS						7 2	(EPA 1986).
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7 3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E. Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION Divide Line 4 by 1440 and Multiply by 100							
CHEMICAL Sfo =				0.00	100.00	NOTE: NE means Not Evaluated.	
RADIOACTIVE Sfo =				0.00	100.00		
MAXIMUM Sfo =				0.00	100.00		

D044756

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Trenches T 1 to T 11

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Gee/Manji Narra, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Covered Trenches.

T 1 125 drums depleted uranium plus lathe coolant.

T 2 Flattened drums plus sanitary sewage sludge

T 3 Flattened drums plus sanitary sewage sludge

T 4 thru T 11 Flattened drums plus sanitary sewage sludge.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	17.15	5.72	17.15
Sgw =	29.07	9.69	29.07
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044757

GROUNDWATER ROUTE WORKSHEET Site: Trenches

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3.1	VOC detected in groundwater; unpublished data 1985 (PC 1985b). This score reflects guidance from page 9 HRS Users Manual (EPA 1986)
	If Observed Release is Given a Score of 45, Proceed to Line 4							
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3.2	
	A Depth to Aquifer of Concern	0 1 2 3	ME	2	0	6		
	B Net Precipitation	0 1 2 3	ME	1	0	3		
	C Permeability of the Unsaturated Zone	0 1 2 3	ME	1	0	3		
	D Physical State	0 1 2 3	ME	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	ME	1	0	3	3.3	
4.	WASTE CHARACTERISTICS						3.4	
	Chemical							
	A. Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Sewage sludge with heavy metals: toxicity 3; persistence 3 (Sax) Assumes >900 drums total. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986).
	B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	3	1	3	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 19 21 26	7	1	7	26		156 pCi/l uranium in well (EPEIS 1980).
	B Maximum Potential	0 1 3 7 11 15 21 26	ME	1	0	26		Insufficient data to calculate maximum potential hwst score.
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				21	26		
	RADIOACTIVE				7	26		
5	TARGETS						3.5	
	A Groundwater Use	0 1 2 3	3	3	6	9		Assumed use for drinking water with alternate source available Distance to nearest well 1 to 2 miles About 30 rural wells within 3 miles; population served assumed at 100 (3.8 people per well). This scoring reflects guidance from pages 26 to 27 HRS Users Manual (EPA 1986).
	B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	12	1	12	40		
	TOTAL TARGETS SCORE				18	49		
6.	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				17010	57330		
	RADIOACTIVE				5670	57330		
7.	NORMALIZATION							
	Divide Line 6 by 57330 and Multiply by 100							
	CHEMICAL Sgw =				29.67	100.00		NOTE: ME means Not Evaluated.
	RADIOACTIVE Sgw =				9.89	100.00		
	MAXIMUM Sgw =				29.67	100.00		

D044758

SURFACE WATER ROUTE WORKSHEET Site: Trenches

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF REC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release. This score reflects guidance from page 29 HRS Users Manual (EPA 1986)
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A Facility Slope and Intervening Terrain	0 1 2 3	2	1	2	3		Facility slope 3 to 5%; intervening terrain >5%.
B 1 yr 24 hr Rainfall	0 1 2 3	1	1	1	3		24 hr rainfall 1 2 in. (Fig. 6, 40CFR300 App A)
C Distance to Nearest Surface Water	0 1 2 3	2	2	4	6		Woman Creek is >1000 ft away This scoring reflects guidance from page 32 HRS Users Manual (EPA 1986)
D Physical State	0 1 2 3	3	1	3	3		Sanitary sewage sludge (Chem 1973). Used liquid.
TOTAL ROUTE CHARACTERISTICS SCORE				10	15		
3 CONTAINMENT	0 1 2 3	0	1	0	3	4.3	Trenches have adequate cover; containment pond on Woman Creek. This score of zero gives a surface water
4 WASTE CHARACTERISTICS						4.4	route score of zero at step 6; therefore, the rest of
Chemical							this sheet is not scored. This score reflects guidance
A. Toxicity/Persistence	0 3 6 9 12 15 18(DRE		1	0	18		from page 36 HRS Users Manual (EPA 1986).
B. Hazardous Waste Quantity	0 1 2 3 4 5 NE 6 7 8		1	0	8		
Radioactive							
A Maximum Observed	0 1 3 7 11 15 NE 21 25		1	0	25		
B Maximum Potential	0 1 3 7 11 15 NE 21 25		1	0	25		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	26		
RADIOACTIVE				0	25		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	NE	3	0	9		
B Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C Population Served/ Distance to Water	0 4 6 8 10 12 16 18 20	NE	1	0	40		
Intake Downstream	24 30 32 35 40						
TOTAL TARGETS SCORE				0	55		
6. CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7 NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sow =				0.00	100.00		NOTE: NE score Not Evaluated.
RADIOACTIVE Sow =				0.00	100.00		
MAXIMUM Sow =				0.00	100.00		

D044759

AIR ROUTE WORK SHEET Site: Trenches

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	5 1	No observed release; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, then Sa = 0 Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						5.2	
Chemical							
A Reactivity and Incompatibility	0 1 2 3	ME	1	0	3		
B Toxicity	0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive	0 2 5 8 12 16 20	ME	1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	ME	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	ME	2	0	6		
C. Land Use	0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: ME scores not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	29.67	9.00	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		880.35	97.01	
Square Root of Sum		29.67	9.80	
TOTAL MIGRATION SCORE	(Sm)	17.15	5.72	Square Root of Sum Divided by 1.73

D044760

DIRECT CONTACT WORKSHEET Site: Trenches

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	6 1	No observed incident of personnel contamination or injury
	If Observed Incident is Given a Score of 45, Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3		1	1	3	6 2	Security guard, covered trenches
3.	CONTAINMENT	0 15	0	1	15	15	6 3	Covered trenches This score of zero gives a direct contact score of zero at step 6; therefore, the rest of this sheet is not scored. This score reflects guidance from pages 37 to 40 HRS Users Manual (EPA 1986).
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	ME	3	0	15	6 4	
	Radioactive	0 1 2 4 6 9 12 15	ME	1	0	15		
5	TARGETS							
	A Population within a 1 Mile Radius	0 1 2 3 4 5	ME	4	0	20	6 5	
	B. Distance to a Critical Habitat	0 1 2 3	ME	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
			CHEMICAL		0	21600		
			RADIOACTIVE		0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100							
			CHEMICAL Sds =		0.00	100.00		NOTE: ME score not Evaluated.
			RADIOACTIVE Sds =		0.00	100.00		
			MAXIMUM Sds =		0.00	100.00		

D044761

FIRE AND EXPLOSION WORKSHEET Site: Trenches

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential- therefore entire score is zero This score reflects guidance from page 49 HRS Users Manual
2 WASTE CHARACTERISTICS						7 2	(EPA 1986)
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS						7 3	
A Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E. Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	26		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION							
Divide Line 4 by 1440 and multiply by 100							
CHEMICAL Sfe =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sfe =				0.00	100.00		
MAXIMUM Sfe =				0.00	100.00		

D044762

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Reactive Metal Destruction Site

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: Plant Manager

NAME OF REVIEWER: Ken Gee/Manji Narra, LANL DATE: April 1986

GENERAL DESCRIPTION OF THE FACILITY:
(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for ratings agency action, etc.)

This area was used from 1956 to 1970 for the destruction of 400 to 500 pounds of lithium metal, small quantities of other reactive metals (sodium, calcium, and magnesium) and some solvent type organic chemicals (Dunn 1973). After destruction by reactions, the residues were covered with landfill. It is assumed that the empty containers were not disposed, but were returned for reuse. The areas used were assumed to have been on the ground surface rather than trenches.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	19.32	0.00	19.32
Sgw =	26.06	0.00	26.06
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D0447C3

GROUNDWATER ROUTE WORKSHEET Site: Reactive Metal Destruction Site

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0 45	45	1	45	45	3.1	VOC detected in groundwater; unpublished data 1985
	If Observed Release is Given a Score of 45, Proceed to Line 4							This score reflects guidance from page 9 HRS Users Manual (EPA 1986).
	If Observed Release is Given a Score of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						3.2	
	A Depth to Aquifer of Concern	0 1 2 3	ME	2	0	6		
	B Net Precipitation	0 1 2 3	ME	1	0	3		
	C. Permeability of the Unsaturated Zone	0 1 2 3	ME	1	0	3		
	D Physical State	0 1 2 3	ME	1	0	3		
	TOTAL ROUTE CHARACTERISTICS SCORE				0	15		
3	CONTAINMENT	0 1 2 3	ME	1	0	3	3.3	
4	WASTE CHARACTERISTICS						3.4	
	Chemical							
	A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed persistent organic chemicals and lithium carbonates: toxicity of 3; persistence of 3 (Sax) Total less than 1 ton (Olson 1973). This score reflects guidance from page 19 HRS Users Manual (EPA 1986).
	B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		
	Radioactive							
	A Maximum Observed	0 1 3 7 11 15 21 26	ME	1	0	26		
	B Maximum Potential	0 1 3 7 11 15 21 26	ME	1	0	26		
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL				19	26		
	RADIOACTIVE				0	26		
5	TARGETS						3.5	
	A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 1 to 2 miles. About 30 rural wells within 3 miles; population served assumed at 100 (3.8 people per well). This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1986)
	B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 26 30 32 34 40	12	1	12	40		
	TOTAL TARGETS SCORE				18	49		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL				15390	57330		
	RADIOACTIVE				0	57330		
7	NORMALIZATION							
	Divide Line 6 by 57330 and Multiply by 100							
	CHEMICAL Sgw =				26.84	100.00		NOTE: ME score not evaluated.
	RADIOACTIVE Sgw =				0.00	100.00		
	RATIONAL Sgw =				26.84	100.00		

D044764

SURFACE WATER ROUTE WORKSHEET Site: Reactive Metal Destruction Site

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A Facility Slope and Intervening Terrain	0 1 2 3	3	1	3	3		Facility slope <5%; intervening terrain <5%.
B. 1 yr 24 hr. Rainfall	0 1 2 3	1	1	1	3		24 hr rainfall 1.2 in (Fig. 8, 40CFR300 App. A)
C. Distance to Nearest Surface Water	0 1 2 3	2	2	4	6		Walnut Creek is >1000 ft away.
D. Physical State	0 1 2 3	3	1	3	3		Assumed some liquid.
TOTAL ROUTE CHARACTERISTICS SCORE				11	15		
3 CONTAINMENT	0 1 2 3	0	1	0	3	4.3	Covered pit; containment pond on Walnut Creek. This score of zero gives a surface route score of zero at
4 WASTE CHARACTERISTICS						4.4	step 4; therefore, the rest of this sheet is not
Chemical							scored. This score reflects guidance from page 34 HRS
A Toxicity/Persistence	0 3 6 9 12 15 18		1	0	18		Users Manual (EPA 1986).
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		
B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	26		
RADIOACTIVE				0	26		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	NE	3	0	9		
B. Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C Population Served/ Distance to Water	0 4 6 8 10 12 14 16 18 20	NE	1	0	40		
Intake Downstream	24 30 32 35 40						
TOTAL TARGETS SCORE				0	55		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7 NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sum =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sum =				0.00	100.00		
MAXIMUM Sum =				0.00	100.00		

D044765

AIR ROUTE WORK SHEET

Site: Rocketyne Metal Destruction Site

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	S 1	No observed air releases; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, then Sa = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2							
2 WASTE CHARACTERISTICS						S 2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	NE	1	0	3		
B Toxicity	0 1 2 3	NE	3	0	9		
C. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 2 5 8 12 16 20NE	NE	1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	NE	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C. Land Use	0 1 2 3	NE	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	36.84	0.00	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		730.48	0.00	
Square Root of Sum		36.84	0.00	
TOTAL MIGRATION SCORE	(Sm)	19.52	0.00	Square Root of Sum Divided by 1.73

D044766

DIRECT CONTACT WORKSHEET — Site: Reactive Metal Destruction Site

	RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury.
	If Observed Incident is given a Score of 45, Proceed to Line 4							
	If Observed Incident is given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guards; adequate surface cover
3	CONTAINMENT	0 15	0	1	0	15	8.3	Adequate surface cover. This score of zero gives a direct contact score of zero or step 6; therefore, the rest of this page is not scored. This score reflects guidance from pages 57 to 60 HRS Users Manual (EPA 8.4 1986)
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	ME	5	0	15		
	Radioactive	0 1 2 4 6 9 12 15	ME	1	0	15		
5	TARGETS							
	a. Population Within a 1 Mile Radius	0 1 2 3 4 5	ME	4	0	20	8.5	
	b. Distance to a Critical Habitat	0 1 2 3	ME	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
			CHEMICAL		0	21600		
			RADIOACTIVE		0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100							
			CHEMICAL Sub =		0.00	100.00		NOTE: All scores are evaluated.
			RADIOACTIVE Sub =		0.00	100.00		
			MAXIMUM Sub =		0.00	100.00		

D044767

FIRE AND EXPLOSION WORKSHEET Site: Reactive Metal Destruction Site

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential, therefore entire score is zero This score reflects guidance from page 49 HRS Users Manual
2 WASTE CHARACTERISTICS						7 2	(EPA 1986)
A Direct Evidence	0 3	NE	1	0	3		
B. Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3. TARGETS						7 3	
A Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D. Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 mile Radius	0 1 2 3 4 5	NE	1	0	5		
F. Buildings Within 2 mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION							
Divide Line 4 by 1440 and Multiply by 100							
CHEMICAL S% =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE S% =				0.00	100.00		
MAXIMUM S% =				0.00	100.00		

D044768

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Original Landfill

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Ken/Merrill Harris, LANL DATE: April 1986

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; evacuation route of major concern; types of information needed for ranking; agency action, etc.)

Closed landfill; used from 1952 to 1968. Assumed to contain small quantities of chemicals. Known to contain about 44 pounds of depleted uranium.

Estimated volume 2 million cu ft Unlined but adequately covered.

SCORES:	CHEMICAL	RADIOACTIVE	MARINE
Sm =	10.00	4.37	10.00
Sgw =	26.00	7.91	26.00
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044769

GROUNDWATER ROUTE WORKSHEET Site: Original Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	3 1	No observed release. This score reflects guidance from page 9 HRS Users Manual (EPA 1984).
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3 2	
A Depth to Aquifer of Concern	0 1 2 3	3	2	6	6		Depth to shallow aquifer 10-20 ft , varies seasonally (Starr 1978)
B Net Precipitation	0 1 2 3	0	1	0	3		Precipitation 16 in. (Fig. 3, 480PR200 App. A); Lake Evaporation 42 in. (Fig. 4, 480PR200 App. A).
C. Permeability of the Unsaturated Zone	0 1 2 3	3	1	3	3		Highly permeable (Starr 1978)
D Physical State	0 1 2 3	3	1	3	3		Assumed small amounts of liquid organic chemicals
TOTAL ROUTE CHARACTERISTICS SCORE				12	19		This scoring reflects guidance from pages 9 to 16 HRS Users Manual (EPA 1984).
3 CONTAINMENT	0 1 2 3	3	1	3	3	3 3	Closed landfill, no liner
4. WASTE CHARACTERISTICS						3 4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Assumed some persistent organics and heavy metals; toxicity of 3; persistence of 3 (Sum).
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	5	1	5	8		Assumed contaminated volume is 0 2% of total 2 million cubic feet, or 370 cubic yards. This scoring reflects guidance from page 19 HRS Users Manual (EPA 1984)
Radioactive							156 pCi/l Uranium (DOE/S 1980)
A Maximum Observed	0 1 3 7 11 15 21 26	7	1	7	26		
B Maximum Potential	0 1 3 7 11 15 21 26	0	1	0	26		44 pounds depleted uranium in landfill
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				23	26		
RADIOACTIVE				7	26		
5 TARGETS						3.5	
A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 36 40	12	1	12	40		Distance to nearest well 1 to 2 miles. About 50 rural wells within 3 miles; population served assumed at 100 (3 8 people per well) This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1984).
TOTAL TARGETS SCORE				18	49		
6. CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				14904	57330		
RADIOACTIVE				4536	57330		
7. NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Sgw =				26.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sgw =				7.91	100.00		
MAXIMUM Sgw =				26.00	100.00		

D044770

SURFACE WATER ROUTE WORKSHEET Site: Original Landfill

	RATING FACTOR	VALUE ASSIGNED	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	0	45	0	1	0	45	4.1 No observed release. This score reflects guidance from page 29 HRS Users Manual (EPA 1986)
	If Observed Release is Given a Value of 45, Proceed to Line 4							
	If Observed Release is Given a Value of 0, Proceed to Line 2							
2	ROUTE CHARACTERISTICS						4.2	
	A Facility Slope and Intervening Terrain	0 1 2 3		3	1	3	3	Facility slope 2% (0 side); intervening terrain >5%.
	B 1 yr 24 hr. Rainfall	0 1 2 3		1	1	1	3	24 hr rainfall 1.2 in. (Fig. 8, 480/R2000 App. A).
	C. Distance to Nearest Surface Water	0 1 2 3		3	2	6	6	Woman Creek about 40 ft. away.
	D Physical State	0 1 2 3		3	1	3	3	Assume some small amounts of liquid organic chemicals
	TOTAL ROUTE CHARACTERISTICS SCORE					13	15	
3	CONTAINMENT	0 1 2 3		0	1	0	3	4.3 Landfill has adequate cover; contaminant pond on Woman Creek. This score of zero give a surface water
4	WASTE CHARACTERISTICS							4.4 route score of zero at step 6; therefore, the rest of
	Chemical							this sheet is not scored. This score reflects
	A. Toxicity/Persistence	0 3 6 9 12 15 18 ME		1		0	18	guidance from page 34 HRS Users Manual (EPA 1986).
	B Hazardous Waste Quantity	0 1 2 3 4 5 ME 0 7 8		1		0	8	
	Radioactive							
	A. Maximum Observed	0 1 3 7 11 15 ME 21 26		1		0	26	
	B. Maximum Potential	0 1 3 7 11 15 ME 21 26		1		0	26	
	TOTAL WASTE CHARACTERISTICS SCORE							
	CHEMICAL					0	26	
	RADIOACTIVE					0	26	
5	TARGETS						4.5	
	A Surface Water Use	0 1 2 3	ME	3		0	9	
	B. Distance to Sensitive Environment	0 1 2 3	ME	2		0	6	
	C Population Served/ Distance to Water Intake Downstream	0 6 8 8 10 ME 12 16 18 20 24 30 32 35 40		1		0	40	
	TOTAL TARGETS SCORE					0	55	
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5						64350	
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
	CHEMICAL					0		
	RADIOACTIVE					0		
7	NORMALIZATION							
	Divide Line 6 by 64350 and Multiply by 100							
	CHEMICAL Sum =					0.00	100.00	NOTE: ME means not Evaluated.
	RADIOACTIVE Sum =					0.00	100.00	
	MAXIMUM Sum =					0.00	100.00	

D044771

AIR ROUTE WORK SHEET

Site: Original Landfill

RATING FACTOR	VALUE RANGE	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF. SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE Date and Location: Sampling Protocol: If Line 1 is 0, then So = 0 Enter on Line 5 If Line 1 is 45, Then Proceed to Line 2.	0	45	0 1	0	45	S 1	No observed air release; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
2 WASTE CHARACTERISTICS						S 2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	ME	1	0	3		
B Toxicity	0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive	0 2 5 8 12 16 20#8		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	ME	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	ME	2	0	6		
C Land Use	0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATIONS Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL So =				0.00	100.00		NOTE: ME scores not evaluated.
RADIOACTIVE So =				0.00	100.00		
MAXIMUM So =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	25.00	7.91	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		625.00	62.60	
Square Root of Sum		25.00	7.91	
TOTAL MIGRATION SCORE	(Sm)	15.00	4.97	Square Root of Sum Divided by 1.73

D044772

DIRECT CONTACT WORKSHEET Site: Original Landfill

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTIPLIER	SCORE	MAX. SCORE	REP SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury.
	If Observed Incident is Given a Score of 45 Proceed to Line 4							
	If Observed Incident is Given a Score of 0, Proceed to Line 2							
2	ACCESSIBILITY	0 1 2 3	1	1	1	3	8.2	Security guards covered landfill.
3	CONTAINMENT	0 15	0	1	0	15	8.3	Covered Landfill. This score of zero gives a direct exposure score of zero at step 4; therefore the rest of this sheet is not scored. This score reflects guidance from pages 57 to 60 HRS Users Manual (EPA 1986)
4	WASTE CHARACTERISTICS							
	Chemical Toxicity	0 1 2 3	NE	5	0	15	8.4	
	Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5.	TARGETS							
	A Population Within a 1 Mile Radius	0 1 2 3 4 5	NE	4	0	20	8.5	
	B Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
	TOTAL TARGETS SCORE				0	32		
6	CALCULATION							
	If Line 1 is 45, Multiply 1 x 4 x 5							
	If Line 1 is 0, Multiply 2 x 3 x 4 x 5			CHEMICAL	0	21600		
				RADIOACTIVE	0	21600		
7	NORMALIZATION							
	Divide Line 6 by 21600 and Multiply by 100			CHEMICAL Pds =	0.00	100.00		NOTE: NE means Not Evaluated.
				RADIOACTIVE Pds =	0.00	100.00		
				MAXIMUM Pds =	0.00	100.00		

D044773

FIRE AND EXPLOSION WORKSHEET Site: Original Landfill

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential, therefore, entire score is zero This score reflects guidance from page 49 HRS Users Manual
2 WASTE CHARACTERISTICS						7 2	(EPA 1986)
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				0	20		
RADIOACTIVE				0	20		
3. TARGETS						7 3	
A Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION Multiply 1 x 2 x 3 CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5 NORMALIZATION Divide Line 4 by 1440 and Multiply by 100 CHEMICAL Pts =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Pts =				0.00	100.00		
MAXIMUM Pts =				0.00	100.00		

D044774

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Cooling Tower Blowdown Ponds

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner
Rockwell International, Operator

NAME OF REVIEWER: Ken Rea/Manji Narra, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

three small surface impoundments used for the containment of blowdown from
cooling towers. It is assumed that these impoundments were backfilled without
removal of the residues. One pond measured about 30x100 ft , the other two
measured about 25x75 ft Two may have been used for destruction of
lithium metal (Dunn 1973), and all three may have received depleted
uranium (Dunn 1973). All would have contained chromates.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	12.61	0.00	12.61
Sgw =	21.48	0.00	21.48
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044775

GROUNDWATER ROUTE WORKSHEET Site: Cooling Tower Blowdown Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	3.1	No observed release This score reflects guidance from page 9 HRS Users Manual (EPA 1986)
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3 2	
A Depth to Aquifer of Concern	0 1 2 3	3	2	6	6		Depth to shallow aquifer 10 20 ft , varies seasonally (Murr 1976)
B Net Precipitation	0 1 2 3	0	1	0	3		Precipitation 10 in. (Fig 5, 40CFR300 App. A);
C Permeability of the Unsaturated Zone	0 1 2 3	3	1	3	3		Lake Evaporation 42 in. (Fig. 4, 40CFR300 App A) Highly permeable (Murr 1976).
D Physical State	0 1 2 3	3	1	3	3		Liquid Biocides and residue from lithium destruction This scoring reflects guidance from pages 9 to 16 HRS Users Manual (EPA 1986).
TOTAL ROUTE CHARACTERISTICS SCORE				12	15		
3 CONTAINMENT	0 1 2 3	3	1	3	3	3 3	Covered area; no liner
4 WASTE CHARACTERISTICS						3 4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	18	1	18	18		Chromosome Toxicity 3; persistence 3 (Dam).
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		Assumed volume less than 40 drums This score reflects guidance from page 19 HRS Users Manual (EPA 1986).
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		Insufficient data to calculate maximum observed HWS score
B Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		Insufficient data to calculate maximum potential HWS score.
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				19	26		
RADIOACTIVE				0	26		
5 TARGETS						3 5	
A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 1 to 2 miles
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	12	1	12	40		Above 90 rural wells within 3 miles; population served assumed at 100 (3 0 people per well). This scoring reflects guidance from pages 26 to 27 HRS Users Manual (EPA 1986).
TOTAL TARGETS SCORE				18	49		
6. CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				12312	57330		
RADIOACTIVE				0	57330		
7. NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Sgw =				21.48	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sgw =				0.00	100.00		
MAXIMUM Sgw =				21.48	100.00		

D044776

SURFACE WATER ROUTE WORKSHEET Site: Cooling Tower Blowdown Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release. This score reflects guidance from page 29 HRS Users Manual (EPA 1986)
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A. Facility Slope and Intervening Terrain	0 1 2 3	0	1	0	3		Facility slope < 3%; intervening terrain < 3% (Map No. 19901 40, 1984).
B. 1 yr. 24 hr. Rainfall	0 1 2 3	1	1	1	3		24 hr rainfall 1 2 in. (Fig. 8, 40CFR280 App. A)
C. Distance to Nearest Surface Water	0 1 2 3	2	2	4	6		North Walnut Creek about 3000 ft. away.
D. Physical State	0 1 2 3	3	1	3	3		Liquid blowdown and residues from lithium destruction (Dunn 1973).
TOTAL ROUTE CHARACTERISTICS SCORE				8	15		
3 CONTAINMENT	0 1 2 3	0	1	0	3	4.3	Covered area; no liner; containment pond on Walnut Creek. This score of zero gives a surface
4 WASTE CHARACTERISTICS						4.4	water route score of zero at step 6; therefore, the rest of this sheet is not scored. This score reflects
Chemical							guidance from page 34 HRS Users Manual (EPA 1986).
A Toxicity/Persistence	0 3 6 9 12 15 18(18)		1	0	18		
B Hazardous Waste Quantity	0 1 2 3 4 5 NS 6 7 8		1	0	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 NS 21 25		1	0	25		
B. Maximum Potential	0 1 3 7 11 15 NS 21 25		1	0	25		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	26		
RADIOACTIVE				0	25		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3 NS		3	0	9		
B Distance to Sensitive Environment	0 1 2 3 NS		2	0	6		
C Population Served/ Distance to Water	0 4 6 8 10 NS 12 16 18 20		1	0	40		
Intake Downstream	24 30 32 35 40						
TOTAL TARGETS SCORE				0	55		
6 CALCULATIONS					64350		
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7 NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sw =				0.00	100.00		NOTE: NS means Not Evaluated.
RADIOACTIVE Sw =				0.00	100.00		
MAXIMUM Sw =				0.00	100.00		

D044777

AIR ROUTE WORK SHEET — Site: Cooling Tower Blowdown Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	5.1	No observed air release; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, the Sa = 0 Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						5.2	
Chemical							
A. Reactivity and Incompatibility	0 1 2 3	ME	1	0	3		
B. Toxicity	0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive	0 2 5 8 12 16 20	ME	1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	ME	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	ME	2	0	6		
C Land Use	0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: ME means Not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	21.48	0.00	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		461.30	0.00	
Square Root of Sum		21.48	0.00	
TOTAL MIGRATION SCORE	(Sm)	12.41	0.00	Square Root of Sum Divided by 1.73

D044778

DIRECT CONTACT WORKSHEET Site: Cooling Tower Blowdown Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF. SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1. OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury.
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3		1	1	3	8.2	Security guards covered.
3 CONTAINMENT	0 15	0	1	0	15	8.3	Ponds covered. This score of zero gives a direct contact score of zero as step 8; therefore the rest of this sheet is not scored. This score reflects guidance from pages 57 to 60 HRS Users Manual (EPA 8.4 1986).
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	ME	5	0	15		
Radioactive	0 1 2 4 6 9 12 15	ME	1	0	15		
5 TARGETS							
A. Population Within a 1 Mile Radius	0 1 2 3 ... 5	ME	4	0	20	8.5	
B. Distance to a Critical Habitat	0 1 2 3	ME	4	0	12		
TOTAL TARGETS SCORE				0	32		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
		CHEMICAL		0	21600		
		RADIOACTIVE		0	21600		
7. NORMALIZATION							
Divide Line 6 by 21600 and Multiply by 100							
		CHEMICAL Sds =		0.00	100.00		NOTE: ME means not Evaluated.
		RADIOACTIVE Sds =		0.00	100.00		
		MAXIMUM Sds =		0.00	100.00		

D044779

FIRE AND EXPLOSION WORKSHEET Site: Cooling Tower Blowdown Ponds

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential; therefore, the entire score is zero. This score reflects guidance from page 49 HRS Users
2 WASTE CHARACTERISTICS						7 2	Manual (EPA 1986)
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E. Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3. TARGETS						7 3	
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	1440		
RADIOACTIVE				0	1440		
5. NORMALIZATION							
Divide Line 4 by 1440 and Multiply by 100							
CHEMICAL Site =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Site =				0.00	100.00		
MAXIMUM Site =				0.00	100.00		

D044780

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Oil Sludge Disposal

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: Plant Manager

NAME OF REVIEWER: Ken Gee/Margit Harris, LASL DATE: April 1986

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

A covered pit approximately 20 x 30 ft in size, used in 1958 for the disposal of 20 to 30 drums of nonradioactive oil sludge.

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	9.15	0.00	9.15
Sgw =	15.00	0.00	15.00
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044781

GROUNDWATER ROUTE WORKSHEET Site: Oil Sludge Disposal

RATING FACTOR	VALUE RANGE	SOIL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	3.1	No observed release. This score reflects guidance from page 9 HRS Users Manual (EPA 1986).
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3.2	
A. Depth to Aquifer of Concern	0 1 2 3	3	2	6	6		Depth to shallow aquifer 10 20 ft , varies seasonally (Nyer 1976).
B. Net Precipitation	0 1 2 3	0	1	0	3		Precipitation 18 in. (Fig. 5, 40CFR300 App A);
C. Permeability of the Unsaturated Zone	0 1 2 3	3	1	3	3		Lake Evaporation 42 in. (Fig. 4, 40CFR300 App. A) Highly permeable (Nyer 1978).
D. Physical State	0 1 2 3	3	1	3	3		Liquid oil sludge at time of disposal This scoring reflects guidance from pages 9 to 16 HRS Users Manual (EPA 1986).
TOTAL ROUTE CHARACTERISTICS SCORE				12	15		
3 CONTAINMENT	0 1 2 3	3	1	3	3	3.3	Covered pit, no liner.
4 WASTE CHARACTERISTICS						3.4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	12	1	12	18		Petroleum characterization (Table 4, 40CFR300 App. A)
B. Hazardous Waste	0 1 2 3 4 5	2	1	2	8		Toxicity 3; persistence 1 Assumed volume 20 to 50 drums (Dunn 1979). This scoring reflects guidance from page 19 HRS Users Manual (EPA 1986).
Quantity	6 7 8						
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 NE 21 26		1	0	26		
B. Maximum Potential	0 1 3 7 11 15 NE 21 26		1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				14	26		
RADIOACTIVE				0	26		
5 TARGETS						3.5	
A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 1 to 2 miles
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	12	1	12	40		About 10 rural wells within 3 miles; population served assumed at 100 (3.8 people per well). This scoring reflects guidance from pages 24 to 27 HRS Users Manual (EPA 1986).
TOTAL TARGETS SCORE				18	49		
6 CALCULATIONS							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				6972	57330		
RADIOACTIVE				0	57330		
7. NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Sgw =				12.02	100.00		NOTE: NE scores not Evaluated.
RADIOACTIVE Sgw =				0.00	100.00		
MAXIMUM Sgw =				12.02	100.00		

D044782

SURFACE WATER ROUTE WORKSHEET Site: Oil Sludge Disposal

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	4.1	No observed release. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4.2	
A Facility Slope and Intervening Terrain	0 1 2 3	2	1	2	3		Facility slope < 3%; intervening terrain < 3%.
B 1 yr 24 hr Rainfall	0 1 2 3	1	1	1	3		24 hr rainfall 1 2 in. (Fig 8, 40CFR300 App A)
C Distance to Nearest Surface Water	0 1 2 3	3	2	6	6		Walnut Creek about 900 ft. away
D Physical State	0 1 2 3	3	1	3	3		Liquid oil sludge at time of disposal
TOTAL ROUTE CHARACTERISTICS SCORE				12	15		
3 CONTAINMENT	0 1 2 3	0	1	0	3	4.3	Covered pit; containment pond on Walnut Creek. This score of zero gives a surface water route score of 4.6 zero at step 6; therefore, the rest of this sheet is not scored. This score reflects guidance from page 34 HRS Users Manual (EPA 1986).
4 WASTE CHARACTERISTICS							
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18		1	0	18		
B Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		
B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	26		
RADIOACTIVE				0	26		
5 TARGETS						4.5	
A Surface Water Use	0 1 2 3	NE	3	0	9		
B Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C. Population Served/ Distance to Water	0 4 6 8 10 12 16 18 20	NE	1	0	40		
Intake Downstream	24 30 32 35 40						
TOTAL TARGETS SCORE				0	35		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5					64350		
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7. NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sm =				0.00	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sm =				0.00	100.00		
MAXIMUM Sm =				0.00	100.00		

D044783

AIR ROUTE WORK SHEET — Site: Oil Sludge Disposal

RATING FACTOR	VALUE RANGE	REL VAL	MULTI PLIER	SCORE	MAX. SCORE	REF. SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	5.1	No observed air releases; therefore, entire air route score is zero. This score reflects guidance from page 39 HRS Users Manual (EPA 1986).
Date and Location:							
Sampling Protocol:							
If Line 1 is 0, then Sa = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						5.2	
Chemical							
A Reactivity and Incompatibility	0 1 2 3	NE	1	0	3		
B. Toxicity	0 1 2 3	NE	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 2 5 8 12 16 20NE		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	20		
RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	NE	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	NE	2	0	6		
C. Land Use	0 1 2 3	NE	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATIONS							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: NE score not evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE
Groundwater Route	(Sgw)	15.62	0.00
Surface Water Route	(Ssw)	0.00	0.00
Air Route	(Sa)	0.00	0.00
Sum of Squares		230.40	0.00
Square Root of Sum		15.62	0.00
TOTAL MIGRATION SCORE	(Sm)	9.10	0.00

Square Root of Sum Divided by 1.73

D044784

DIRECT CONTACT WORKSHEET Site: Oil Sludge Disposal

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3		1	1	3	8.2	Security guards covered pit
3 CONTAINMENT	0 15	0	1	0	15	8.3	Covered pit. This score of zero gives a direct contact score of zero at step 6; therefore, the rest of this sheet is not scored. This score reflects guidance from pages 57 to 60 HRS Users Manual (EPA 1984)
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	NE	3	0	15	8.4	
Radioactive	0 1 2 4 6 9 12 15	NE	1	0	15		
5 TARGETS							
A Population within a 1 Mile Radius	0 1 2 3 4 5	NE	4	0	20	8.5	
B. Distance to a Critical Habitat	0 1 2 3	NE	4	0	12		
TOTAL TARGETS SCORE				0	32		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0	21600		
RADIOACTIVE				0	21600		
7 NORMALIZATION							
Divide Line 6 by 21600 and Multiply by 100							
CHEMICAL Site =				0.00	100.00		NOTE: NE score not Evaluated.
RADIOACTIVE Site =				0.00	100.00		
MAXIMUM Site =				0.00	100.00		

D044715

FIRE AND EXPLOSION WORKSHEET Site: Oil Sludge Disposal

	RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1	OBSERVED RELEASE	1 3	0	1	0	3	7.1	No potential; therefore, entire score is zero. This score reflects guidance from page 49 HRS Users Manual
2	WASTE CHARACTERISTICS						7.2	(EPA 1986).
	A Direct Evidence	0 3	NE	1	0	3		
	B Ignitability	0 1 2 3	NE	1	0	3		
	C Reactivity	0 1 2 3	NE	1	0	3		
	D Incompatibility	0 1 2 3	NE	1	0	3		
	E Waste Quantity							
	Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
	Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
	TOTAL WASTE CHARACTERISTICS SCORE							
		CHEMICAL			0	20		
		RADIOACTIVE			0	20		
3	TARGETS						7.3	
	A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
	B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
	C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
	D. Land Use	0 1 2 3	NE	1	0	3		
	E Population Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
	F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
	TOTAL TARGETS SCORE				0	24		
4	CALCULATION							
	Multiply 1 x 2 x 3							
		CHEMICAL			0	1440		
		RADIOACTIVE			0	1440		
5	NORMALIZATION							
	Divide Line 4 by 1440 and Multiply by 100							
		CHEMICAL Site =			0.00	100.00		NOTE: NE means Not Evaluated.
		RADIOACTIVE Site =			0.00	100.00		
		MAXIMUM Site =			0.00	100.00		

D044786

HAZARD RANKING SYSTEM/MODIFIED HAZARD RANKING SYSTEM (HRS/MHRS)

HRS/MHRS SUMMARY COVER SHEET

SITE NAME: Lithium Metal Destruction Site

FIELD OFFICE: Rocky Flats Plant

EPA REGION: VIII

PERSON(S) IN CHARGE OF SITE: DOE, Owner

Rockwell International, Operator

NAME OF REVIEWER: Ken Dee/Ralf Hertz, LANL DATE: April 1988

GENERAL DESCRIPTION OF THE FACILITY:

(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Two small covered pits used for the destruction of lithium metal

SCORES:	CHEMICAL	RADIOACTIVE	MAXIMUM
Sm =	7.79	0.00	7.79
Sgw =	13.47	0.00	13.47
Ssw =	0.00	0.00	0.00
Sa =	0.00	0.00	0.00
Sfe =	0.00	0.00	0.00
Sdc =	0.00	0.00	0.00

D044787

GROUNDWATER ROUTE WORKSHEET Site: Lithium Metal Destruction Site

RATING FACTOR	VALUE RANGES	SEL. VAL.	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	3.1	No observed release. This score reflects guidance from page 9 HRS Users Manual (EPA 1986).
If Observed Release is Given a Score of 45, Proceed to Line 4							
If Observed Release is Given a Score of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						3.2	
A Depth to Aquifer of Concern	0 1 2 3	3	2	6	6		Depth to shallow aquifer 10-20 ft , varies seasonally (Durr 1979).
B Net Precipitation	0 1 2 3	0	1	0	3		Precipitation 10 in. (Fig. 5, 40CFR300 App. A);
C Permeability of the Unsaturated Zone	0 1 2 3	3	1	3	3		Lake Evaporation 42 in. (Fig. 4, 40CFR300 App. A) Highly permeable (Durr 1979).
D. Physical State	0 1 2 3	2	1	2	3		Powder or fine granular. This scoring reflects guidance from pages 9 to 16 HRS Users Manual (EPA 1986).
TOTAL ROUTE CHARACTERISTICS SCORE				11	15		
3. CONTAINMENT	0 1 2 3	3	1	3	3	3.3	Covered pits; no liner.
4 WASTE CHARACTERISTICS						3.4	
Chemical							
A Toxicity/Persistence	0 3 6 9 12 15 18	12	1	12	18		Lithium carbonate; toxicity 2 (max), persistence 3.
B. Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	1	1	8		Assumed volume less than 40 drums. This score reflects guidance from page 19 HRS Users Manual (EPA 1986).
Radioactive							
A. Maximum Observed	0 1 3 7 11 15 21 26	NE	1	0	26		
B. Maximum Potential	0 1 3 7 11 15 21 26	NE	1	0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				13	26		
RADIOACTIVE				0	26		
5 TARGETS						3.5	
A Groundwater Use	0 1 2 3	2	3	6	9		Assumed use for drinking water with alternate source available. Distance to nearest well 1 to 2 miles
B Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	12	1	12	40		About 50 rural wells within 3 miles; population served assumed at 100 (3.8 people per well). This scoring reflects guidance from pages 26 to 27 HRS Users Manual 1986).
TOTAL TARGETS SCORE				18	49		
6 CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				7722	57330		
RADIOACTIVE				0	57330		
7 NORMALIZATION							
Divide Line 6 by 57330 and Multiply by 100							
CHEMICAL Sgw =				13.47	100.00		NOTE: NE means Not Evaluated.
RADIOACTIVE Sgw =				0.00	100.00		
MAXIMUM Sgw =				13.47	100.00		

D044788

SURFACE WATER ROUTE WORKSHEET Site: Lithium Metal Destruction Site

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	4 1	No observed release This score reflects guidance from page 29 HRS Users Manual (EPA 1986).
If Observed Release is Given a Value of 45, Proceed to Line 4							
If Observed Release is Given a Value of 0, Proceed to Line 2							
2 ROUTE CHARACTERISTICS						4 2	
A Facility Slope and Intervening Terrain	0 1 2 3	1	1	1	3		Facility slope < 3%/ intervening terrain 3.6% (Map No 19501 40, 1986).
B. 1 yr 24 hr Rainfall	0 1 2 3	1	1	1	3		24 hr rainfall 1 2 in. (Fig. 8, 40CFR300 App A).
C Distance to Nearest Surface Water	0 1 2 3	2	2	4	6		North Walnut Creek about 2100 ft away. This scoring reflects guidance from page 32 HRS Users Manual (EPA 1986). Powder or fine material
D Physical State	0 1 2 3	2	1	2	3		
TOTAL ROUTE CHARACTERISTICS SCORE				8	15		
3. CONTAINMENT	0 1 2 3	0	1	0	3	4 3	Covered pits; containment pond on Walnut Creek This score of zero gives a surface water route score of zero
4 WASTE CHARACTERISTICS						4 4	at step 4; therefore, the rest of this sheet is not scored. This scoring reflects guidance from page 34 HRS Users Manual (EPA 1986).
Chemical							
A. Toxicity/Persistence	0 3 6 9 12 15 18(NE)	1		0	18		
B. Hazardous Waste Quantity	0 1 2 3 4 5 NE 6 7 8	1		0	8		
Radioactive							
A. Radium Observed	0 1 3 7 11 15 NE 21 26	1		0	26		
B. Radium Potential	0 1 3 7 11 15 NE 21 26	1		0	26		
TOTAL WASTE CHARACTERISTICS SCORE							
CHEMICAL				0	26		
RADIOACTIVE				0	26		
5 TARGETS						4 5	
A Surface Water Use	0 1 2 3 NE	3		0	9		
B Distance to Sensitive Environment	0 1 2 3 NE	2		0	6		
C Population Served/ Distance to Water	0 4 6 8 10 NE 12 16 18 20	1		0	40		
Intake Downstream	24 30 32 35 40						
TOTAL TARGETS SCORE				0	55		
6. CALCULATION							
If Line 1 to 45, Multiply 1 x 4 x 5					64350		
If Line 1 to 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0			
RADIOACTIVE				0			
7. NORMALIZATION							
Divide Line 6 by 64350 and Multiply by 100							
CHEMICAL Sw =				0.00	100.00		NOTE: NE score not evaluated.
RADIOACTIVE Sw =				0.00	100.00		
MAXIMUM Sw =				0.00	100.00		

D044789

AIR ROUTE WORK SHEET — Site: Lithium Metal Destruction Site

RATING FACTOR	VALUE-RANGE	SEL VAL	MULTIPLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	0 45	0	1	0	45	5.1	No observed air releases; therefore, entire air route score is zero. This scoring reflects guidance from page 39 HRS Users Manual (EPA 1986)
Date and Location:							
Sampling Procedure:							
If Line 1 is 0, then Sa = 0. Enter on Line 5							
If Line 1 is 45, Then Proceed to Line 2.							
2 WASTE CHARACTERISTICS						5.2	
Chemical							
A Reactivity and Incompatibility	0 1 2 3	ME	1	0	3		
B. Toxicity	0 1 2 3	ME	3	0	9		
C Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	ME	1	0	8		
Radioactive	0 2 5 8 12 16 20ME		1	0	20		
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				0	20		
TOTAL WASTE CHARACTERISTICS SCORE RADIOACTIVE				0	20		
3 TARGETS							
A. Population Within 4 Mile Radius	0 9 12 15 18 21 24 27 30	ME	1	0	30		
B. Distance to Sensitive Environment	0 1 2 3	ME	2	0	6		
C Land Use	0 1 2 3	ME	1	0	3		
TOTAL TARGETS SCORE				0	39		
4 CALCULATION							
Multiply 1 x 2 x 3							
CHEMICAL				0	35100		
RADIOACTIVE				0	35100		
5 NORMALIZATION							
Divide Line 4 by 35100 and Multiply by 100							
CHEMICAL Sa =				0.00	100.00		NOTE: ME means Not Evaluated.
RADIOACTIVE Sa =				0.00	100.00		
MAXIMUM Sa =				0.00	100.00		

SUMMARY CALCULATION OF TOTAL MIGRATION SCORE

		CHEMICAL	RADIOACTIVE	
Groundwater Route	(Sgw)	13.47	0.00	
Surface Water Route	(Ssw)	0.00	0.00	
Air Route	(Sa)	0.00	0.00	
Sum of Squares		181.42	0.00	
Square Root of Sum		13.47	0.00	
TOTAL MIGRATION SCORE	(Sm)	7.79	0.00	Square Root of Sum Divided by 1.73

D044790

DIRECT CONTACT WORKSHEET Site: Lithium Metal Destruction Site

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED INCIDENT	0 45	0	1	0	45	8.1	No observed incident of personnel contamination or injury.
If Observed Incident is Given a Score of 45, Proceed to Line 4							
If Observed Incident is Given a Score of 0, Proceed to Line 2							
2 ACCESSIBILITY	0 1 2 3		1	1	3	8.2	Security guards covered pits.
3 CONTAINMENT	0 15	0	1	0	15	8.3	Covered pits. This score of zero gives a direct contact score of zero at step 6; therefore, the rest of this sheet is not scored. This scoring reflects guidance from pages 57 to 60 HRS Users Manual (EPA 1986).
4 WASTE CHARACTERISTICS							
Chemical Toxicity	0 1 2 3	ME	5	0	15	8.4	
Radioactive	0 1 2 4 6 9 12 15	ME	1	0	15		
5 TARGETS							
A. Population within a 1 Mile Radius	0 1 2 3 4 5	ME	4	0	20	8.5	
B. Distance to a Critical Habitat	0 1 2 3	ME	4	0	12		
TOTAL TARGETS SCORE				0	32		
6. CALCULATION							
If Line 1 is 45, Multiply 1 x 4 x 5							
If Line 1 is 0, Multiply 2 x 3 x 4 x 5							
CHEMICAL				0	21600		
RADIOACTIVE				0	21600		
7 NORMALIZATION							
Divide Line 6 by 21600 and Multiply by 100							
CHEMICAL Sub =				0.00	100.00		NOTE: ME means Not Evaluated.
RADIOACTIVE Sub =				0.00	100.00		
MAXIMUM Sub =				0.00	100.00		

D044791

FIRE AND EXPLOSION WORKSHEET Site: Lithium Metal Destruction Site

RATING FACTOR	VALUE RANGE	SEL VAL	MULTI PLIER	SCORE	MAX SCORE	REF SEC.	REFERENCES FOR EACH ASSIGNED SCORE
1 OBSERVED RELEASE	1 3	0	1	0	3	7 1	No potential; therefore, entire score is zero This scoring reflects guidance from page 49 HRS Users Manual 7 2 (EPA 1986)
2 WASTE CHARACTERISTICS							
A Direct Evidence	0 3	NE	1	0	3		
B Ignitability	0 1 2 3	NE	1	0	3		
C. Reactivity	0 1 2 3	NE	1	0	3		
D Incompatibility	0 1 2 3	NE	1	0	3		
E Waste Quantity							
Chemical	0 1 2 3 4 5 6 7 8	NE	1	0	8		
Radioactive	0 1 2 3 5 6 8	NE	1	0	8		
TOTAL WASTE CHARACTERISTICS SCORE CHEMICAL				0	20		
RADIOACTIVE				0	20		
						7 3	
3. TARGETS							
A. Distance to Nearest Population	0 1 2 3 4 5	NE	1	0	5		
B. Distance to Nearest Building	0 1 2 3	NE	1	0	3		
C. Distance to Sensitive Environment	0 1 2 3	NE	1	0	3		
D Land Use	0 1 2 3	NE	1	0	3		
E Population Within 2 mile Radius	0 1 2 3 4 5	NE	1	0	5		
F Buildings Within 2 Mile Radius	0 1 2 3 4 5	NE	1	0	5		
TOTAL TARGETS SCORE				0	24		
4 CALCULATION Multiply 1 x 2 x 3			CHEMICAL	0	1440		
			RADIOACTIVE	0	1440		
5. NORMALIZATION Divide Line 4 by 1440 and multiply by 100			CHEMICAL S% =	0 00	100 00		NOTE: NE scores not Evaluated.
			RADIOACTIVE S% =	0 00	100 00		
			MAXIMUM S% =	0 00	100.00		

D044792

APPENDIX C
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